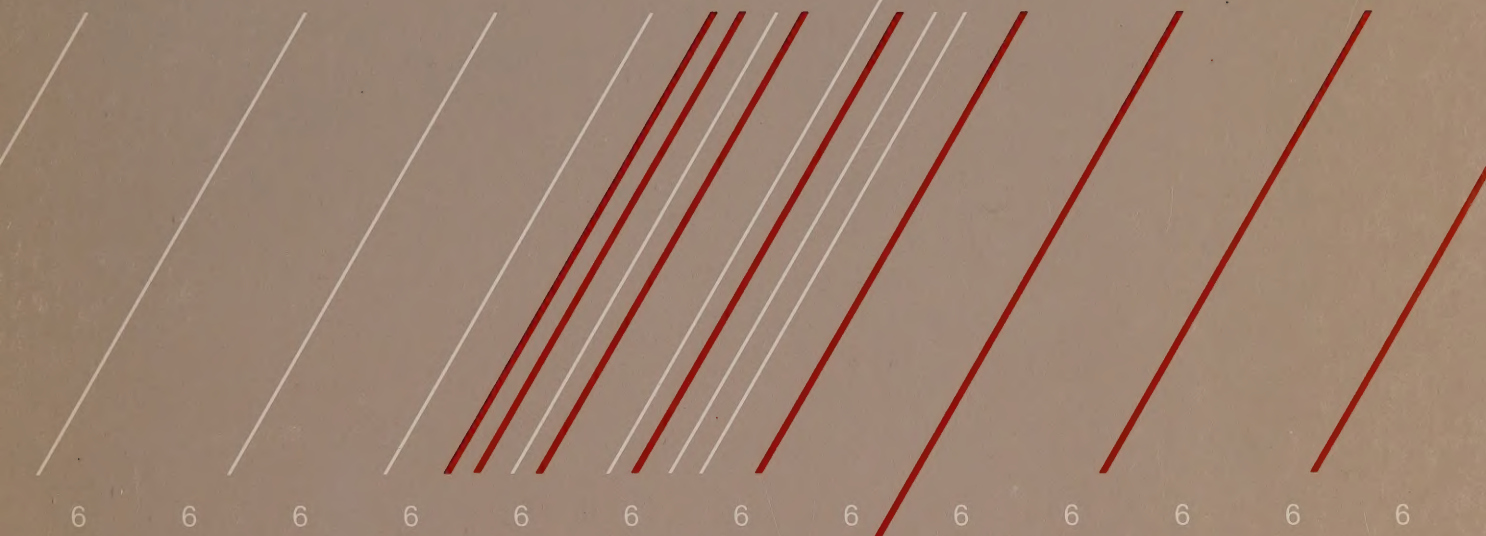
The Ontario
Task Force on
Employment and
New Technology



Employment and New Technology in the Metal Fabricating Industry

An Appendix to the Final Report

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Co-Chairmen of the Task Force

WILLIAM B. BOGGS
Chairman and President, The de Havilland Aircraft of Canada Ltd.

ROBERT WHITE
Director for Canada, United Auto Workers Union

Members of the Task Force

RALPH BARFORD
Chairman, Valleydene Corporation Ltd.

JALYNN BENNETT
Investment Vice-President, The Manufacturers Life Insurance Co.

LUCIE NICHOLSON
President, Ontario Division, Canadian Union of Public Employees

FRED POMEROY
President, Communications Workers of Canada

THOMAS ARMSTRONG
Deputy Minister, Ontario Ministry of Labour

BENSON WILSON
Chairman, Ontario Manpower Commission

Staff

Richard Brown, Research Director

Stanley But

Hildegard Martens

APPENDIX 6

EMPLOYMENT AND NEW TECHNOLOGY

IN THE METAL FABRICATING INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report, but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

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FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May, 1984, "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the end of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Metal Fabricating Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

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The Board of Industrial Leadership and Development (BILD) of the Government of Ontario.

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The Ontario Ministry of Labour.

The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study is greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE METAL FABRICATING INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

July 1985

Submitted By: Maureen Farrow
Currie, Coopers
& Lybrand
Management
Consultants

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EMPLOYMENT AND NEW TECHNOLOGY IN THE METAL FABRICATING INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Metal Fabricating Industry. The Metal Stamping Pressing Coating Industry (SIC 304)[2] is described in Section I, followed by Hardware, Tool and Cutlery Manufacturers (SIC 306)[2] in Section II and finally, in Section III, Miscellaneous Metal Fabricating Industries (SIC 309)[2] are discussed.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.

- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1984 which provides background and a perspective on the industry's historical development.

- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

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1 Manpower and Employment Implications of New Technologies in Selected Manufacturing Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

2 1970, Standard Industrial Classification (SIC), Statistics Canada.

- a review of recent and anticipated technology adoptions,

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Metal Fabricating Industry were identified using the 1982 Census of Manufacturers.[1] All firms with twenty or more employees were included in the sample frame. Employment in these firms is estimated to include 97 percent of the 17,730 employees (1982) in the Metal Stamping, Pressing and Coating Industry; 90 percent of the 12,826 employees in the Hardware, Tool and Cutlery Manufacturing Industry and 98 percent of the 12,235 employees in the Miscellaneous Metal Fabricating Industries.

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1 Manufacturing Industries of Canada: National and Provincial Areas, 1982, Statistics Canada, Catalogue No. 31-203.

A representative, random sample of firms[1], stratified by employment size categories (see Appendix A), was chosen from each industry sample frame. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual.

A search was carried out of the Ontario Ministry of Labour Collective Agreements Library to identify unions in the sample firms. Union head offices were contacted to identify the appropriate union leader in each of the unionized firms in the sample. The same questionnaire was sent to union representatives. Copies of the survey questionnaires are attached as Appendix B together with outlines of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms and unions who participated in the sample survey are shown in the following table.

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1 The number of firms should not be confused with the number of establishments. Establishments are production centres. Therefore, a firm may have more than one establishment.

The number of establishments for each segment of the industry can be located in Appendix D, the Historical Tables.

TABLE 1

METAL FABRICATING INDUSTRY

NUMBER OF FIRMS AND UNIONS RESPONDING BY FIRM EMPLOYMENT SIZE

Firms by Employment Size	SIC 304 Metal Stamping, Pressing and Coating			SIC 306 Hardware, Tool and Cutlery			SIC 309 Miscellaneous Metal Fabricating		
	Firms	Unions	Firms in Sample Frame (1)	Firms	Unions	Firms in Sample Frame (1)	Firms	Unions	Firms in Sample Frame (1)
Small (20-99)	4	1	105	5	2	108	4	2	80
Medium (100-499)	8	1	38	6	3	26	5	3	28
Large (500 +)	2	1	2	0	1	1	2	1	2
Total Firms	14	3	145	11	6	135	11	6	110

(1) Source: Statistics Canada, Census of Manufacturers, 1982.

In most cases, several participants in each organization contributed to the completion of a questionnaire. In the Metal Stamping, Pressing and Coating Industry survey, an average of 1.9 participants contributed to a firm questionnaire and 1.0 participants to a union questionnaire. The companies' principal participants had an average of 18 years' experience with their firms and 23 years in the industry. The unions' principal participants had an average of 16 years experience with the industry.

In the Hardware, Tool and Cutlery Manufacturers survey, an average of 2.4 participants contributed to a firm questionnaire and 1.8 participants to a union questionnaire. The companies' principal participants had an average of 22 years' experience both with their firms and in the industry. The union's principal participants had an average of 17 years' experience with the industry.

In the Miscellaneous Metal Fabricating Industries' survey an average of 1.1 participants contributed to a firm questionnaire and 1.0 participants to a union questionnaire. The companies' principal participants had an average of 9 years' experience with their firms and 23 years in the industry. The unions' principal participants had an average of 16 years' experience with the industry.

The sample survey results have been weighted up to the number of firms in each sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with twenty or more employees in the Metal Fabricating Industry in Ontario.

The reliability for the sample for the Metal Stamping, Pressing and Coating Industry is estimated at 99 percent, with a 5 percent allowable error; 94 percent with a 5 percent allowable error for the Hardware, Tool and Cutlery Manufacturing Industry; and 99 percent with a 5 percent allowable error for the Miscellaneous Metal Fabricating Industries. See Appendix C for an explanation of the sample reliability calculation method.

Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The Metal Fabricating Industry report covers SIC 304, the Metal Stamping, Pressing and Coating Industry; SIC 306, Hardware, Tool and Cutlery Manufacturers; and SIC 309, Miscellaneous Metal Fabricating Industries. Not included in this report are select metal fabricating industries including Boiler and Plate Works, the Fabricated Structural Metal Industry, the Ornamental and Architectural Metal Industry, Wire and Wire Products Manufacturers, Heating Equipment Manufacturers and Machine Shops.

The report is divided into three sections as follows:

Section I - Metal Stamping, Pressing and Coating Industry (SIC 304)

Section II - Hardware, Tool and Cutlery Manufacturers (SIC 306)

Section III - Miscellaneous Metal Fabricating Industries (SIC 309).

SECTION I - THE METAL STAMPING, PRESSING AND COATING INDUSTRY

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

The three segments of the Metal Fabricating Industry being examined in this report - namely SIC 304 metal stamping, pressing and coating, SIC 306 hardware, tool and cutlery and SIC 309 miscellaneous metal fabricating - all closely followed the business cycle in Canada during the period 1971 to 1984. Characteristically, each of these industries enjoyed strong demand in the expansion of 1971-1974, suffered reduced market demand during the 1974-1975 recession and then subsequently enjoyed the strong cylical expansion of 1975-1980 and likewise all suffered during the recessionary period of the early 1980's.

The Metal Stamping, Pressing and Coating Industry serves many end use industries which are illustrated in Tables D.1 and D.2 in Appendix D of this report.

During the period under review the segment of the industry serving the auto sector has followed the fortunes of the auto industry, closely showing particular weakness in the late 1970's as the two oil shocks of the 1970's changed the consumer's demand from large to small cars with the result of an increase in market share of imported cars in North America. However, as the auto sector led the Ontario economy out of the recession, the metal fabricating sectors related directly to auto production also experienced a pick-up in activity.

The companies involved in product categories related to food canning have witnessed, since the mid 1970's, a flattening out in the demand for their products as a result of the following factors:

- Changes in packaging technology (the introduction of aseptic packaging etc).

- The shift from canned goods to frozen or fresh products. This is particularly true in the case of the shift from canned juice to frozen juices.

- The growth in the 1970's of eating away from home.

- The shift to aluminum cans in the soft drink business.

- The shift to plastic containers for motor oil.

The sector of the Metal Fabricating Industry that is related to the residential and non-residential construction markets closely followed the boom that took place in both new house construction and new industrial and commercial construction during the second half of the 1970's. However, this sector also suffered from the sharp declines in construction activity through the recession. The result of the construction boom of the second half of the 1970's has left a substantial amount of over-capacity in industrial and commercial buildings and, as a result, the companies largely engaged in the manufacture of heating ducts and eavestroughing etc. face a weak non-residential construction market. The companies supplying products to the housing sector enjoyed a pick-up in demand through 1983 in response to the recovery in new housing construction which resulted from government initiatives.

Other segments of the Metal Fabricating Industry enjoyed strong demand from the mega project activity in Western Canada during the 1970's. However, this came to an abrupt end in 1980 following the National Energy Program and also the world recession effects on world oil prices. The demand for metal fabricating products from the energy sector will be slow to recover.

In conclusion, it can be recognized that the Metal Fabricating Industry is diverse and supplies many different end use industries and that the fortunes of each segment are therefore dependent on a variety of factors which are to a large extent desynchronized.

2.1 The Structure of the Industry

This section of the report provides an historical analysis of Metal Stamping, Pressing and Coating Industry trends for the period 1971 to 1981 and 1982 to 1984. In 1982, the Metal Stamping, Pressing and Coating Industry in Ontario included 458 establishments with $1.8 billion of manufacturing shipments. In the same year, SIC 304 accounted for 50 percent of the total manufacturing shipments of SIC's 304, 306 and 309 combined. As such, the Metal Stamping, Pressing and Coating Industry is the largest of the three types of metal fabricating operations under consideration in this report.

The Metal Stamping, Pressing and Coating Industry includes establishments such as Acadian Platers Co. Ltd., Baycoat Limited and Continuous Colour Coat Ltd., that are primarily engaged in coating metal and metal products. Major products of the metal coating segment of the industry are listed in Table D.1 and include custom electroplating, painting and galvanizing. Plating with precious metals is not part of this industry.

Also, included in SIC 304, the Metal Stamping, Pressing and Coating Industry, are establishments such as American Can Canada Inc., The Continental Group of Canada Ltd., Crown Cork & Seal Canada Inc. and Westeel-Roscoe Limited. These establishments are primarily engaged in manufacturing sheet metal products such as metal stamping for automobiles, bottle caps, heel caps, metal laths and metal boxes. Also included are establishments primarily engaged in manufacturing pressed metal products such as kitchen utensils, hospital and similar utensils and containers. Other products of the metal stamping and pressing segment of the industry are tin cans and other tinware and sheet metal products such as metal awnings, heating ducts, roofing and eavestrough. Table D.2 lists the major products of the Metal Stamping and Pressing Industry in order of importance. Metal stampings represented over 25 percent of manufacturing shipments in 1981 followed by metal cans for food and nonfood.

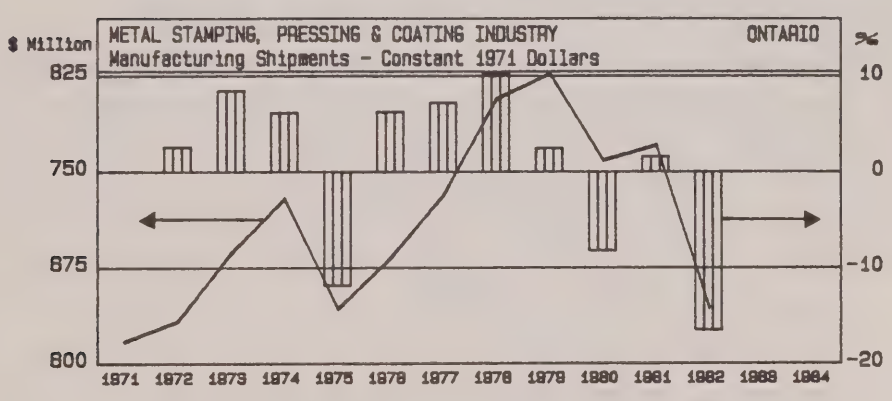
The metal stamping and pressing segment of SIC 304 is much larger than the metal coating segment. In 1981, the value of manufacturing shipments by the metal stamping and pressing segment of the industry was $3.4 billion, over twelve times greater than the $269.1 million of manufacturing shipments by the metal coating segment of SIC 304.

2.2 Industry Trends

Tables D.3 to D.6 present key industry indicators for the years 1971 to 1984.

2.2.1 Aggregate Output

EXHIBIT 1



Manufacturing shipments of the Metal Stamping, Pressing and Coating Industry increased from $616.8 million in 1971 to $2.0 billion in 1981 in current dollars. In constant 1971 dollars, shipments increased from $616.8 million to $770.4 million over the 1971 to 1981 period, recording an average annual rate of real growth of 2.2 percent.

The pattern of constant dollar growth in shipments by SIC 304 was relatively smooth over the 1970's with the exception of a sharp decline in manufacturing shipments in 1975 and again in 1980. These declines reflected the general slowdown in economic activity following the OPEC crisis and oil price explosions of 1973-1974 and 1978-1979.

In 1981, constant dollar shipments increased marginally in real terms before recording a 16.5 percent decline to $643.1 million in 1982. The poor performance of the industry since the late 1970's not only reflects fundamental weaknesses in the Canadian economy and in particular the effects of the economic recession of 1981-1982 but also competitive forces affecting the industry. The metal can segment of the industry has suffered from the introduction of new product alternatives. Plastic containers and aseptic packaging have made significant inroads into the traditional market segments served by metal can manufacturers. Packaging of petroleum and food products in particular has undergone a major transition with the introduction of alternative forms of packaging. Similarly, metal stamping, pressing and coating manufacturers that service the automobile industry have suffered from the introduction of a variety of plastics parts which have replaced metal alternatives in recent years.

2.2.2 Competitive Position

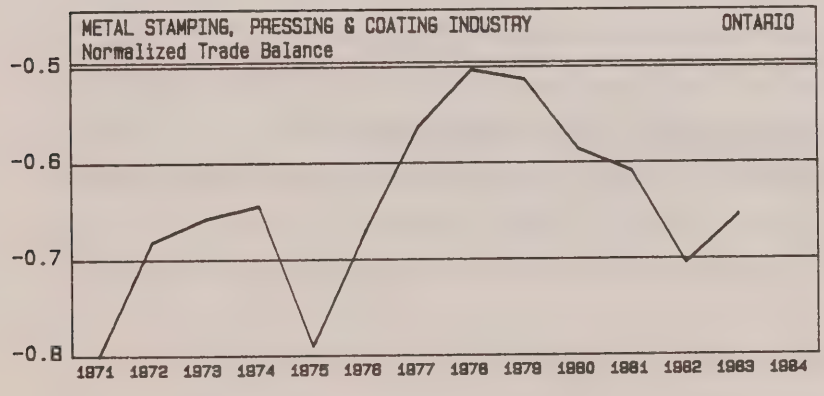
Since 1971, the value of Ontario's imports of Metal Stamping, Pressing and Coating Industry products has exceeded the value of exports. In the period from 1971 to 1976, imports exceeded exports by a six-to-one ratio on average; however, in the period from 1977 to 1981 imports exceeded exports by a lesser four-to-one ratio on average.

Thus, Ontario made some progress in the late 1970's towards reducing the proportion of imports to exports. Nonetheless, much of this progress was lost in the 1980's when exports performed more poorly than imports.

Despite some progress in reducing the ratio of imports to exports, Ontario's negative trade balance continued to increase in absolute terms over the decade to a level of $108.6 million in 1983.

Exhibit 2 below, shows Ontario's normalized trade balance (exports minus imports divided by exports plus imports) for the Metal Stamping, Pressing and Coating Industry. The chart illustrates the trends described above. Ontario's negative trade balance as a percent of total trade reached a minimum for the decade in 1978 before increasing somewhat in the period from 1979 through 1982. In 1983, the normalized trade balance returned to more positive levels due to a 42.6 percent increase in the value of exports combined with a more modest 18.3 percent increase in the value of imports.

EXHIBIT 2

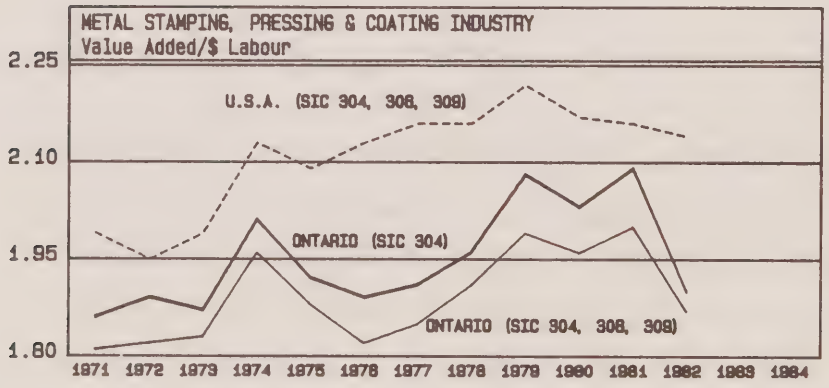


The performance of Ontario's Metal Fabricating Industry can be compared to the counterpart industry in the United States based on an analysis of value added per dollar of labour. A declining ratio indicates that labour has become an increasingly large portion of value added. By implication, an increasing ratio indicates that capital has become an increasingly large portion of value added.

In Ontario, data is available for SIC 304 separately and SIC's 304, 306 and 309 combined. However, in the United States, data is only available for SIC's 304, 306 and 309 combined. Thus, a direct comparison of value added per dollar of labour for SIC 304 in Ontario and the United States is not possible. Nonetheless, one can examine the performance of SIC 304 in Ontario compared to SIC 304, 306 and 309 combined in Ontario and in the United States.

Exhibit 3 below, illustrates that value added per dollar of labour was consistently higher for the three SIC's combined in the United States than for SIC 304 or the three SIC's combined in Ontario over the period 1971 to 1982. Also, value added per dollar of labour in Ontario was somewhat higher in SIC 304, metal stamping, pressing and coating than in SIC 304, 306 and 309 combined.

EXHIBIT 3



Value added per dollar of labour for SIC 304 gradually trended upward in Ontario over the period 1971 through 1981 before falling off dramatically in 1982. Value added per dollar of labour for the three SIC's combined in the United States also trended upward over the 1970's reaching a temporary peak somewhat earlier, in 1979. The declines in value added per dollar of labour in the United States in the early 1980's were less severe than in Ontario.

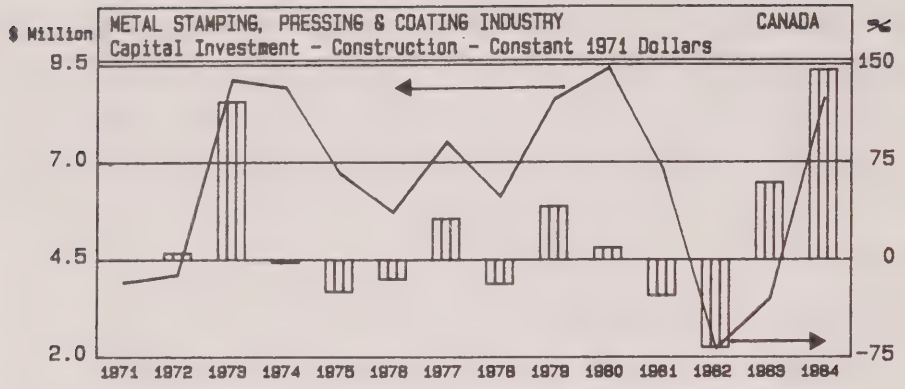
2.2.3 Capital Investment

Capital investment statistics are only available for Canada as a whole for SIC 304; however, in 1982, Ontario based manufacturers in the Metal Stamping, Pressing and Coating Industry accounted for 50.1 percent of Canadian shipments of these products.

Total capital spending by the Metal Stamping, Pressing and Coating Industry increased from $19.6 million in 1971 to $91.0 million in 1981 in current dollars. In the 1982 to 1984 period, total capital spending increased again from a 1982 low of $61.0 million to an expected $116.7 million in 1984.

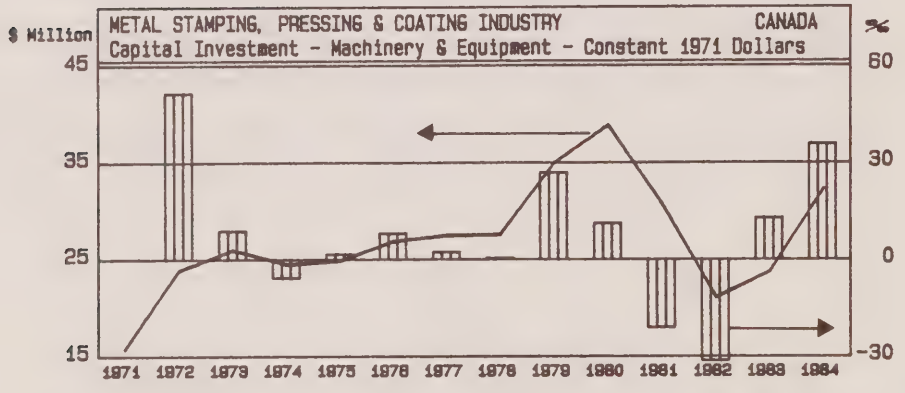
In constant 1971 dollars, capital spending by the Metal Stamping, Pressing and Coating Industry reached a temporary high of $35.0 million in 1973 before falling off somewhat in the mid 1970's. Spending then turned sharply upward again in the late 1970's reaching a peak for the decade at $48.2 million in 1980. Capital spending then fell off drastically during the early 1980's.

EXHIBIT 4



Machinery and equipment spending dominated total capital spending activity in the 1970's, increasing in current dollars from $15.7 million in 1971 to $74.2 million in 1981. By contrast, the corresponding figures for capital spending on construction were $3.9 million in 1971 and $16.8 million in 1981. In constant 1971 dollars, capital spending on machinery and equipment increased at an average annual rate of 6.9 percent from 1971 to 1981 while capital spending on construction grew at an average annual rate of 5.7 percent.

EXHIBIT 5



From 1982 to 1984, current dollar capital spending on machinery and equipment increased from a low of $54.9 million in 1982 to an expected $91.4 million in 1984. Meanwhile construction spending rose from $6.1 million to an expected $25.3 million over the same time period.

Looking at the 1971 to 1984 period as a whole, capital spending clearly experienced a sharp downturn in the early 1980's. In 1981 and 1982, the year over year rate of decline in construction spending exceeded the rate of decline in machinery and equipment spending. By contrast, in 1983 and 1984, the year over year percentage increases in construction spending exceeded the percentage increases recorded by machinery and equipment spending, reversing the weakness previously recorded by the construction component.

2.2.4 Employment

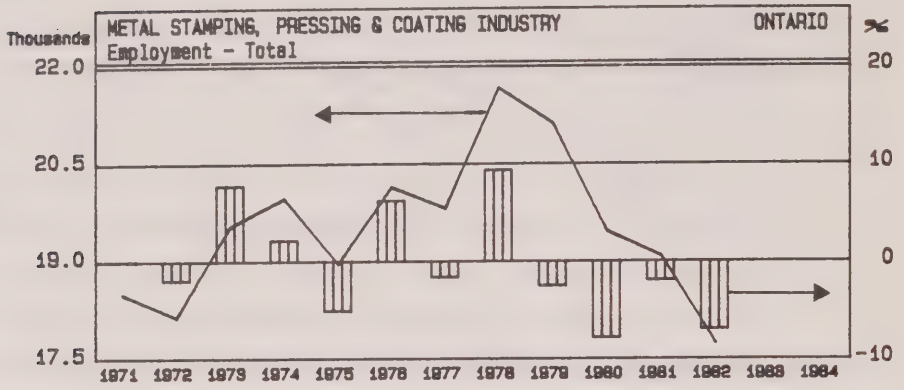
The discussion of employment for the Metal Stamping, Pressing and Coating Industry in Ontario includes an analysis of aggregate trends and occupational change.

- Aggregate Trends

  In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the Census of manufacturing industries conducted by Statistics Canada annually. This data series is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this

data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

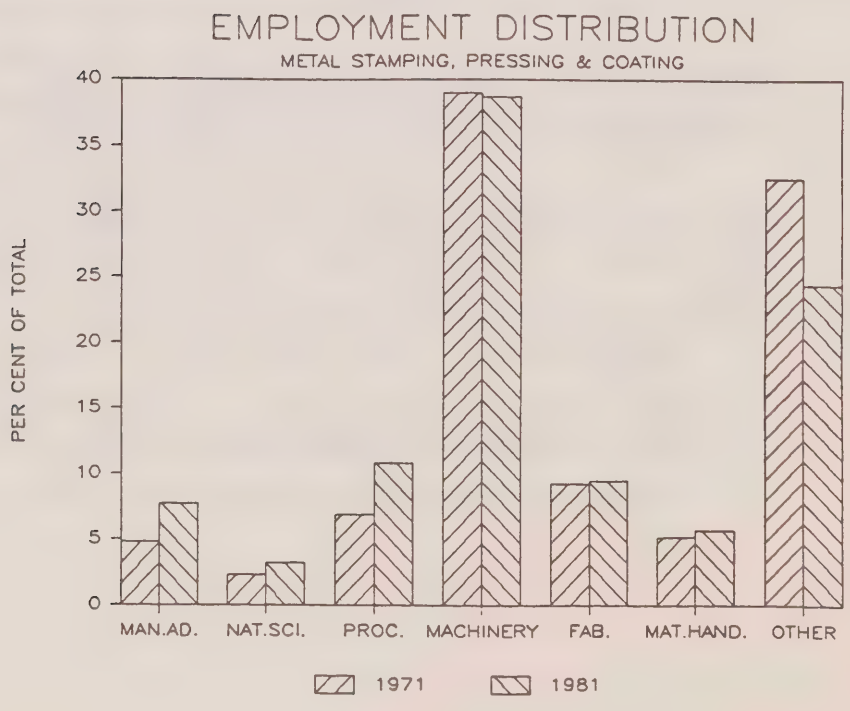
EXHIBIT 6



In 1982, 17,730 persons were employed in SIC 304 compared with 19,062 in 1981 and 18,478 in 1971. Total employment in the industry increased at an average annual rate of 0.3 percent between 1971 and 1981. In 1982, employment declined by 7.0 percent over 1981 levels. Overall, employment declined by 4.0 percent from 1971 to 1982.

- Occupational Changes

EXHIBIT 7



Census data for the Metal Stamping, Pressing and Coating Industry indicates that total employment in the industry increased at an average annual rate of 2.3 percent over the 1971 to 1981 time period. Five of the seven major occupational groups in SIC 304 grew in importance over the 1971 to 1981 period, as indicated in Exhibit 7. Only the Machining and Other groups showed a decrease in their proportions of total employment.

Analysis at the broad occupational level as indicated in Table D7 shows that from 1971 to 1981 the fastest growing occupational category was Managerial, Administrative and Related which averaged annual increases in numbers employed of 7.2 percent from 1971 to 1981. This category still only accounted for 7.7 percent of total employment in SIC 304 in 1981 (compared to 4.8 percent in 1971), and as such was the fourth largest employment category. Processing also experienced rapid average annual growth of 7.0 percent from 1971 to 1981. Processing represented 10.8 percent of total employment in SIC 304 by 1981 as compared to 6.9 percent in 1971. Machining and Related, the largest occupational group in SIC 304, experienced the slowest average annual rate of growth of any major occupational category causing its share of total employment to decline from 39.0 percent in 1971 to 38.7 percent in 1981. The Other occupational group, 48.9 percent of which was made up of clerical workers, declined proportionately to 24.4 percent of total employment in 1981.

Analysis at the four digit occupational level indicates that the fastest growing occupational categories were in the Managerial, Administrative and Related and Processing occupational groups. Sales and advertising management and metal processing and

related, not elsewhere classified, grew at average annual rates of 24.9 and 20.2 percent respectively from 1971 to 1981. Nonetheless, these two groups represented only 0.9 and 2.9 percent of total industry employment respectively in 1981.

The largest detailed occupational category in 1981 was sheet-metal workers, employing 2,225 persons and accounting for 10.7 percent of employment in SIC 304. This occupational group grew at an average annual rate of 6.3 percent from 1971 to 1981 - well above the industry average of 2.3 percent.

The machine-tool operating, metal machining foremen, machinist, machine-tool setting-up and general managers and other senior officials all experienced declines in employment from 1971 to 1981. However, none of these occupational categories represented more than 2.1 percent of industry employment in 1981.

An analysis by sex in the Metal Stamping, Pressing and Coating Industry indicates that female employment as a percent of total employment increased from 17.1 percent in 1971 to 21.6 percent in 1981. An analysis at the broad occupational level shows that female employment as a percent of total employment increased in all the major occupational groups except Product Fabricating, Assembling and Repairing. The Machining and Related category gained the most new jobs for females - 660 - of any occupational group. Nonetheless, female employment was only 16.6 percent of total employment in the Machining and Related group by 1981, compared to 10.6 percent in 1971.

By contrast, the Material Handling and Related group gained only 95 new jobs for females over the decade but female employment as a percent of total was 26.2 percent in 1981 compared to 24.9 percent in 1971.

At the more detailed occupational level, the sheet-metal workers and the metalworking-machine operators occupational groups gained the most new jobs for females from 1971 to 1981 - 370 and 265 respectively. As a result, female employment as a percent of total employment increased from 6.2 percent to 20.0 percent in the sheet-metal workers category and from 18.4 percent to 27.0 percent in the metalworking-machine operators category, from 1971 to 1981.

Female employment as a percent of total employment was highest, at 59.6 percent in 1981, in the packaging, not elsewhere classified category and lowest, at zero in 1981, in the mechanical engineers, general managers and other senior officials, and metal processing and related foremen categories. Most females - 1,345 of a total of 4,510 females in SIC 304 - were employed in Machining and Related jobs as metalworking-machine operators (570 females) and as sheet-metal workers (445 females).

Results of Question 3

TABLE 2: METAL STAMPING, PRESSING AND COATING INDUSTRY

SIC 304

Percent of Firms Planning to Adopt New Technologies by Employment Size

Technologies	Before 1985				1985-1990				1990-1995			
	Small	Medium	Large	Total	Small	Medium	Large	Total	Small	Medium	Large	Total
1. DESIGN TECHNOLOGIES												
Computer-Aided Design (CAD)	0	14	50	7	-	29	100	14	-	14	-	7
Computer-Aided Engineering (CAE)	0	0	0	0	-	20	-	8	-	-	-	-
CAD/CAM Integration	0	14	0	7	-	14	100	7	-	29	-	13
Other	0	0	0	0	-	-	-	-	-	17	-	7
2. MANUFACTURING PLANNING AND CONTROL SYSTEMS												
Computerized Financial Systems	75	88	100	80	25	13	-	20	-	-	-	
Computerized Order Entry/Inventory Control	50	50	100	50	25	50	50	36	25	-	-	14
Computer-Aided Process Planning	0	60	50	23	33	40	50	36	33	-	-	21
Manufacturing Resource Planning Systems (MRP)	25	13	0	20	-	63	100	27	25	-	-	15
Automated Shop Floor Data Collection	0	0	50	0	-	86	50	39	33	14	-	24
Computerized Decision Support Systems	0	0	100	0	33	57	-	44	33	29	-	31
Computerized Maintenance Planning and Control	0	0	0	0	67	67	100	67	33	33	-	33
Other	0	0	0	0	33	-	-	21	100	100	-	100
3. MANUFACTURING PROCESS TECHNOLOGIES												
Numerically Controlled Machines (NC)	33	14	100	25	-	14	-	7	-	14	-	7
Computer Controlled CN Machines (CNC)	33	0	0	18	-	43	100	20	33	-	-	18
CAD Directed CNC	0	0	0	0	-	14	100	7	-	14	-	7
Automatic Casting/Molding ("Near Net" Casting)	0	0	0	0	-	-	-	-	-	-	-	-
Computerized Process Control Systems	33	17	100	27	-	50	-	21	100	100	100	100
Computer-Aided Inspection and Testing	33	0	0	21	-	80	100	31	33	-	-	21
Robotic Applications	0	0	0	0	25	63	100	41	50	13	-	34
Flexible Manufacturing Technologies	0	0	0	0	-	17	-	7	-	-	-	-
Computer Integrated Manufacturing (CIM)	0	0	0	0	-	43	-	20	-	14	-	7
4. MATERIALS HANDLING TECHNOLOGIES												
Automatic Bulk Handlers/Feeder Systems	100	13	100	57	-	38	100	19	33	-	-	17
Automated Conveyor/Vehicle Systems	33	14	100	25	-	29	50	13	33	-	-	18
Automated Storage and Retrieval	0	0	0	0	-	29	-	13	-	-	-	-
Computer Controlled Conveyor/Vehicles	0	0	100	0	-	17	100	7	-	-	-	-
Automated Warehouse	0	0	0	0	-	29	-	13	-	14	-	7
5. TELECOMMUNICATIONS TECHNOLOGIES												
Facsimile (FAX) Link: HO/Plant(s)	67	14	100	43	-	29	-	13	-	-	-	-
Computer Link: HO/Plant(s)	67	0	100	39	33	50	-	40	-	-	-	-
Computer Link: Suppliers/Customers	33	0	50	17	33	88	100	60	-	-	-	-
6. OTHER TECHNOLOGIES	0	14	100	7	0	43	0	20	-	-	-	-

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for periods 1985-1990 and 1990-1995 to indicate respondents, at the time of the survey, are not planning to adopt this technology or 'don't know'. Responses are not mutally exclusive.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this study presents the survey results which discuss firms' surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Metal Stamping, Pressing and Coating Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The industry has made a start in adopting many of the new technologies available at present. This progress is expected to continue in the next ten years. Small firms are less definite than other firms about their future plans, but the industry as a whole intends to adopt a broad range of new technologies. Table 2 summarizes the percentage of firms who adopted new technologies before 1985 and who plan future innovations in the next ten years.

3.1.1 Design Technologies

Design technologies have yet to gain wide use in the industry. However, large and medium sized firms plan to continue purchases of computer assisted design (CAD) and begin installing computer assisted engineering (CAE) systems in the next five years.

3.1.2 Manufacturing Planning and Control Technologies

The computer is already in widespread use for financial and order entry/inventory control tasks and is beginning to be

used in process planning and manufacturing resource planning. Firms plan to introduce or extend these applications significantly in the next five years. The next ten years should see progress by many firms in other areas such as shop floor data collection and computer use in decision support and maintenance planning.

The survey indicates that small firms may lag the others to 1990 but express intentions about purchases in the 1990 to 1995 period which may help them catch up.

3.1.3 Manufacturing Process Technologies

Firms have adopted a narrow range of new technology in this area to date. Some numerically controlled machines and computerized process control systems are in use, especially among large firms. Large and medium sized firms plan to innovate in other areas in the 1985 to 1990 period. (Small firms have less definite plans than their larger counterparts.) These innovations focus on computerized numerically controlled machines (CNC), computer aided inspection and testing and computer integrated manufacturing. Firms expect to introduce robots for some manufacturing tasks in the next ten years. Small firms plan to purchase steadily to 1995 while larger firms plan their heaviest robot purchasing before 1990.

3.1.4 Materials Handling Technologies

About 60 percent of the industry is using some form of automatic bulk handling and feeding system and about 25 percent are believed to have an automated conveyor system in use at present. Firms plan modest purchases in the next

ten years of these and other materials handling technologies. These include automated storage and retrieval, computer controlled conveyors and automated warehousing. In both the 1985 to 1990 and 1990 to 1995 periods, each of the materials handling technologies is expected to attract purchases from no more than 20 percent of the industry.

3.1.5 Telecommunications Technologies

About 45 percent of the industry has a facsimile (FAX) link between plant and head office. Computer links between plant and head office are almost as widespread. More purchases of these systems are scheduled for 1985 to 1990, but firms will concentrate on setting up computer links with their suppliers and customers in this period. An estimated 60 percent of the industry will establish a link of this sorts, with large firms leading others in installation. Plans for the years after 1990 are unstated.

3.1.6 Other Technologies

A small number of firms identified other technologies of potential importance to their operations. These included such disparate subjects as waste control, statistical process control, new welding techniques and the introduction of aseptic packages.

3.2 Forces Driving the Need to Adopt New Technology

The leading forces driving the industry to innovate are:

- the need to lower costs,
- competitive pressures,
- the need to increase quality, and
- the need to increase productivity.

Results of Question 4

TABLE 3: METAL STAMPING, PRESSING AND COATING INDUSTRY SIC 304

Most Important Factors Driving the Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
COMPETITIVE PRESSURES	First	0	50	0	21
	Second	0	25	0	10
	Third	25	0	50	15
	Weighted Importance (1)	0.3	2.0	0.5	1.0
STRATEGIC	First	0	13	0	5
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.4	0.0	0.2
CUSTOMER DEMANDS FOR CHANGES	First	25	0	0	14
	Second	0	13	0	5
	Third	0	0	0	0
	Weighted Importance	0.8	0.3	0.0	0.6
INCREASE PROFITABILITY	First	0	0	0	0
	Second	0	0	0	0
	Third	25	0	0	14
	Weighted Importance	0.3	0.0	0.0	0.2
INCREASE PRODUCTIVITY	First	25	0	0	14
	Second	25	0	0	14
	Third	0	25	0	10
	Weighted Importance	1.3	0.3	0.0	0.8
INCREASE QUALITY	First	0	25	50	11
	Second	25	38	0	30
	Third	0	0	0	0
	Weighted Importance	0.5	1.5	1.5	0.9
INCREASE MANAGEMENT INFORMATION	First	0	0	0	0
	Second	0	0	0	0
	Third	0	13	0	5
	Weighted Importance	0.0	0.1	0.0	0.1
LOWER COSTS	First	25	13	0	20
	Second	25	13	50	20
	Third	25	13	50	20
	Weighted Importance	1.5	0.8	1.5	1.2
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	25	0	50	15
	Second	0	0	0	0
	Third	0	13	0	5
	Weighted Importance	0.8	0.1	1.5	0.5
ENTER NEW MARKETS/ GROWTH	First	0	0	0	0
	Second	0	0	50	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	1.0	0.0
OBSOLESCENCE	First	0	0	0	0
	Second	0	0	0	0
	Third	0	13	0	5
	Weighted Importance	0.0	0.1	0.0	0.1
ALL OTHERS	First	0	0	0	0
	Second	25	0	0	14
	Third	0	0	0	0
	Weighted Importance	0.5	0.0	0.0	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Small firms focus on costs and productivity as major stimuli for technical change. Medium sized firms believe competitive pressures and quality considerations are influencing them to adopt new technology. Large firms are influenced by costs and quality as well. The survey results appear in Table 3.

3.3 Forces That Could Slow The Rate of Technology Adoption

The cost of new technology is the leading factor retarding the adoption of new technology. Secondary influences are the ability to finance purchases and the competitive nature of the market environment. This last area includes respondents who feel that in measures of manufacture there are no recent innovations to adopt and others who see no new markets into which they can readily expand.

Other factors deserve mention. Small firms refer in some cases to managerial intransigence and, in others, to unwillingness to lay off employees when introducing new technology as retarding influences. Medium sized firms feel restricted by poor economic conditions, past, present and in the future. Finding employees with the requisite skills is also mentioned as a potential difficulty by both large and medium sized firms.

A related problem is that the time required to properly manage the introduction of new machinery and processes is sometimes large, limiting the number or scale of innovations which a firm can efficiently incorporate within a given time period. Respondents' view's appear in Table 4.

Results of Question 5

TABLE 4: METAL STAMPING, PRESSING AND COATING INDUSTRY SIC 304

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
ABILITY TO FINANCE	First	0	38	0	18
	Second	0	13	50	6
	Third	33	0	0	17
	Weighted Importance (1)	0.3	1.4	1.0	0.9
COST OF NEW TECHNOLOGY	First	0	38	50	19
	Second	100	25	0	63
	Third	0	0	0	0
	Weighted Importance	2.0	1.6	1.5	1.8
LACK OF GOVERNMENT ASSISTANCE	First	0	0	50	0
	Second	0	0	0	0
	Third	0	0	50	0
	Weighted Importance	0.0	0.0	2.0	0.0
COMPETITIVE ENVIRONMENT	First	33	13	0	23
	Second	0	0	0	0
	Third	0	25	0	12
	Weighted Importance	1.0	0.6	0.0	0.8
POOR ECONOMIC CONDITIONS	First	0	13	0	6
	Second	0	13	0	6
	Third	0	25	0	12
	Weighted Importance	0.0	0.9	0.0	0.4
EMPLOYEE ACCEPTANCE	First	0	0	0	0
	Second	0	0	0	0
	Third	0	0	50	0
	Weighted Importance	0.0	0.0	0.5	0
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0	0	0	0
	Second	0	38	50	19
	Third	33	0	0	17
	Weighted Importance	0.3	0.8	1.0	0.5
UNWILLINGNESS TO CHANGE	First	33	0	0	17
	Second	0	0	0	0
	Third	0	13	0	6
	Weighted Importance	1.0	0.1	0.0	0.6
ALL OTHERS	First	33	0	0	17
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	1.0	0.0	0.0	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 1

TABLE 5: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Manufacturing Shipments in Ontario

Firms by Employment Size	Average Annual Compound Rate of Change (1) (in Constant Dollars)				
	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	3.5	27.0	10.5	6.5	6.5
Medium (100-499)	1.0	9.5	4.0	4.5	5.5
Large (500+)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Firms	2.5	19.5	7.5	5.5	6.0

(1) Rounded to closest 0.5%

Results of Question 17e

TABLE 6: METAL STAMPING, PRESSING AND COATING INDUSTRY

SIC 304

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period		Return on Investment	
	% of Firms Using Pay-Back	Average Period	% of Firms Using ROI	Average Rate
Small (20-99)	100	4 years	50	26.5
Medium (100-499)	100	4 years	40	30.0
Large (500+)	100	3 years	100	27.5
Total Firms	100	4 years	47	27.7

Answers are not mutually exclusive.

Results of Question 17f

TABLE 7: METAL STAMPING, PRESSING AND COATING INDUSTRY

SIC 304

Source of Funds for New Technology Spending

Firms by Employment Size	Internal Funds	External Funds
	Percent	Percent
Small (20-99)	67	33
Medium (100-499)	86	14
Large (500+)	75	25
Total Firms	73	27

4.0 INDUSTRY OUTLOOK TO 1995

This chapter describes the respondents' views on the outlook for the industry in terms of aggregate output (i.e., manufacturing shipments in Ontario) investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Views on the outlook for real growth by the industry vary widely. This is due in part to the wide variety of products manufactured by metal stamping, pressing and coating firms and the resulting difficulty industry executives have in projecting growth outside their own product areas. The figures which appear in Table 5 mask a broad divergence of views. The automotive industry related firms tend to have a strong growth projection, while canning firms and other metal stamping firms are much less optimistic.

The industry as a whole sees growth in the 5.5 to 6.0 percent range following the rapid recovery from the recession in the 1983-1984 period.

4.2 Investment Patterns

Respondents indicate that about 75 percent of investment expenditure in the years to 1995 will be for machinery and equipment. Between 40 and 45 percent of this expenditure will be related to new technology, for the industry, although this component of investment increases with firm size to about 80 percent for large firms. A similar pattern applies for structural investment, which makes up the remaining 25 percent of the total.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The industry appears to require a return on investment of about 28

percent to justify the application of funds. The entire industry appears to use a pay-back criterion, expecting an investment expenditure to pay for itself within about four years. Survey results are presented in Table 6.

4.2.2 Source of New Capital Spending

The industry expects to finance about 73 percent of its new technology investment programs from internal funds and the remaining 27 percent from external funds. See Table 7 for results by firm size group.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

The industry feels that several factors are important determinants of employment levels.

These include:

- the introduction of new technology,
- firm sales and market share, and
- industry wide growth.

For small firms, new technology has a variety of potential influence on employment. The results of the survey show that they look to technology to meet customers' needs, so that it plays a role in their growth plans. However, the immediate effect on employment levels may be contraction, which is a source of concern to firms interested in a stable work force.

Results of Question 11a,b,c

TABLE 8: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0	13	50	6
	Second	0	25	0	12
	Third	0	0	0	0
	Weighted Importance (1)	0.0	0.9	1.5	0.4
INCREASE SALES/ INCREASE MARKET SHARE	First	0	0	0	0
	Second	67	13	0	40
	Third	0	0	0	0
	Weighted Importance	1.3	0.3	0.0	0.8
INTRODUCTION OF NEW TECHNOLOGY	First	33	13	0	23
	Second	0	0	0	0
	Third	0	38	0	18
	Weighted Importance	1.0	0.8	0.0	0.9
SUCCESS IN FOREIGN MARKETS	First	0	0	0	0
	Second	0	0	0	0
	Third	0	13	0	6
	Weighted Importance	0.0	0.1	0.0	0.1
PRODUCT DIVERSIFICATION	First	0	0	50	0
	Second	0	13	0	6
	Third	0	13	0	6
	Weighted Importance	0.0	0.4	1.5	0.2
AVAILABILITY OF NECESSARY SKILLS	First	0	0	0	0
	Second	33	0	0	17
	Third	0	0	0	0
	Weighted Importance	0.7	0.0	0.0	0.3
ABILITY TO COMPETE	First	0	25	0	12
	Second	0	0	0	0
	Third	33	0	0	17
	Weighted Importance	0.3	0.8	0.0	0.5
INDUSTRY-WIDE GROWTH	First	33	13	0	23
	Second	0	13	0	6
	Third	0	0	0	0
	Weighted Importance	1.0	0.6	0.0	0.8
OVERALL ECONOMIC GROWTH	First	0	25	0	12
	Second	0	25	0	12
	Third	0	0	0	0
	Weighted Importance	0.0	1.3	0.0	0.6
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	0	13	0	6
	Second	0	13	0	6
	Third	0	0	0	0
	Weighted Importance	0.0	0.6	0.0	0.3
ALL OTHERS	First	33	0	50	17
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	1.0	0.0	1.5	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 9: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	7.0	4.0	1.0	1.5
Medium (100-499)	1.5	-3.5	2.5	1.5
Large (500+)	2.5	3.5	-3.5	-3.0
Total Firms	3.5	0.5	1.0	1.0

(1) Rounded to closest 0.5%.

Medium sized firms emphasize the importance of overall economics growth, profitability and ability to compete in addition to new technology. Competition by foreign producers is also significant for this group.

Product diversification opportunities are expected to be of major importance to large firms' employment levels. Canning companies are prominent among this group and the survey reflects the pressures discussed in the historical section of this report from innovation on traditional markets made by plastic containers. Another important determinant for these firms is profitability. Table 8 presents the survey results.

4.3.2 Employment Outlook

The industry is expecting modest employment growth in the next ten years. After an anticipated 0.5 percent rate of growth in 1985, firms foresee about 1.0 percent per annum growth to 1995. Large firms, dominated by canning, expect continued recovery in employment in 1985 with growth of about 3.5 percent, but steady declines in excess of 3 percent per annum after that, to 1995. Medium sized firms expect to offset a temporary' decline of 3.5 percent in 1985 with growth of about 2.5 percent per annum to 1990 and a 1.5 percent performance from 1990 to 1995. In contrast, small firms anticipate an employment increase in 1985 of 4 percent and moderate growth of 1.0 to 1.5 percent thereafter. Results of the survey appear in Table 9.

The modest growth in future employment foreseen by respondents contrasts with the relatively strong constant dollar shipments' growth expected. (See section 4.1) Regardless of firm size, shipments' growth is expected to outpace employment growth, indicating that firms expect labour productivity to increase.

Results of Question 12

TABLE 10: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	14.3	12.1	12.4	13.0	13.2
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	2.3	2.0	2.3	2.9	2.8
• Engineers		0	+	+	0
• Engineering Technicians and Technologists		0	+	0	+
• Systems Analysts and Computer Programmers		0	0	0	0
• All Other Science and Mathematics (not listed above)		0	0	0	0
PROCESSING	29.4	36.2	37.6	36.2	35.6
MACHINING	20.6	16.4	15.0	16.3	16.3
• Tool and Die Making		0	0	0	0
• Machinist and Machine Tool Setting-Up		-	-	0	0
• Machine-Tool Operators		-	-	-	0
• Metal Shaping and Forming		0	0	0	0
• Filing, Grinding, Buffing, Cleaning and Polishing		-	-	+	0
• All Other Machining (not listed above)		-	0	+	0
FABRICATING, ASSEMBLING AND REPAIRING	10.4	11.5	11.5	12.3	12.4
• Fabricating and Assembling Metal Products		0	+	+	0
• Industrial Machinery Mechanics and Repairmen		+	-	0	0
• All Other Fabricating, Assembling and Repairing (not listed above)		0	0	0	0
MATERIALS HANDLING AND RELATED	8.0	7.8	7.5	6.6	6.7
ALL OTHER OCCUPATIONS	15.1	14.1	13.7	13.0	12.7
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

4.3.3 Trends in Part-Time Work

Part-time employment is currently insignificant in the Metal Stamping, Pressing and Coating Industry. Survey respondents estimate that about 3 percent of employees are part-time and that this percentage may decline slightly by 1995. Part-time employment is negligible in large firms and is expected to remain so.

4.4 Changes in Occupational Structure

Table 10 shows trends in firms' occupational structure in the industry to 1995.

The following outlines expected occupational changes in employment shares:

- Managerial, Natural Sciences and Fabricating occupational shares will increase slightly.

- Processing and Machining registered abrupt changes from 1981 to 1984 but have stable shares thereafter. The 1981 to 1984 pattern is the result of relatively weaker employment trends for firms with large shares in Machining than for firms with large shares in Processing.

- Materials Handling and All Other occupations should experience moderate declines in share in future.

The table shows that the increase in Natural Sciences' share is likely to be concentrated in engineering occupations. Fabricating's modest gains will occur mostly in fabricating and assembling as opposed to repair work. The fluctuation in Machining is expected to be fairly broadly based.

Results of Question 6

TABLE 11: METAL STAMPING, PRESSING AND COATING INDUSTRY SIC 304

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	0	45	55
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	0	16	84
• Engineering Technicians and Technologists	0	32	68
• Systems Analysts and Computer Programmers	0	30	70
PROCESSING	25	5	70
MACHINING			
• Tool and Die Making	5	1	94
• Machinist and Machine Tool Setting-Up	5	40	55
• Machine-Tool Operators	25	5	70
• Metal Shaping and Forming	10	0	90
• Filing, Grinding, Buffing, Cleaning and Polishing	20	5	75
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	20	5	75
• Industrial Machinery Mechanics and Repairmen	0	49	51
MATERIALS HANDLING AND RELATED	20	5	75
OTHER	0	1	99

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results of the employment effects of new technology in terms of skills match and requirements and the impact on skill levels and job content.

5.1 Effects on Occupations

Firms are frequently either undecided about their employment needs or expect their needs to be matched for the most part by employee availability. However, in several occupations, respondents indicated as a group that they expect shortages or oversupply to develop. Shortages are expected by many firms in the following occupations:

- Managerial,
- all Natural Sciences,
- machinists, and
- industrial machinery mechanics and repairmen.

Oversupply of labour is considered possible, but by no more than 25 percent of the industry in:

- Processing,
- Machining (except for machinists),
- fabricating and assembling metal products, and
- Materials Handling.

Respondents' views are found in Table 11.

5.2 Likely Steps to Deal with Skills Oversupply

Geographic relocation, layoffs and attrition are respondents' most frequently cited approaches to dealing with oversupply. Secondary techniques, which firms expect to use sparingly, include offers of early retirement, curtailed work hours and transfer to related occupations. Table 12 summarizes the survey responses.

Results of Question 7

TABLE 12: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Steps Firms Will Likely Take to Deal With an OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
PROCESSING	Attrition	Early Retirement	Retrain
MACHINING			
• Tool and Die Making	Layoff	(1)	(1)
• Machinist and Machine Tool Setting-Up	Relocation	Layoff	(2)
• Machine-Tool Operators	Attrition	(1)	(1)
• Metal Shaping and Forming	Layoff	Attrition	(2)
• Filing, Grinding, Buffing, Cleaning and Polishing	Relocation	Layoff	(2)
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	Relocation	Layoff	(2)
MATERIALS HANDLING AND RELATED	Relocation	Shorter Hours	Transfer

(1) Only 1 step mentioned.
(2) Only 2 steps mentioned.

Results of Question 8

TABLE 13: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Steps Firms Will Likely Take to Deal With a SHORTAGE of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Retrain	Recruit	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Recruit	Retrain	(1)
• Engineering Technicians and Technologists	Recruit	Retrain	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Retrain	(1)
PROCESSING	Upgrade	Recruit	(1)
MACHINING			
• Tool and Die Making	Recruit	Retrain	(1)
• Machinist and Machine Tool Setting-Up	Recruit	Retrain	(1)
• Machine-Tool Operators	Retrain	(2)	(2)
• Filing, Grinding, Buffing, Cleaning and Polishing	Recruit	(2)	(2)
FABRICATING, ASSEMBLING AND REPAIRING	Recruit	(2)	(2)
• Fabricating and Assembling Metal Products	Recruit	(2)	(2)
• Industry Machinery Mechanics and Repairmen	Contract Out	Recruit	Upgrade
MATERIALS HANDLING AND RELATED	Recruit	(2)	(2)
OTHER	Retrain	Recruit	(1)

(1) Only 2 steps mentioned.
(2) Only 1 step mentioned.

Results of Question 9

TABLE 14: METAL STAMPING, PRESSING AND COATING INDUSTRY SIC 304

Impact of Technology on Skill Levels and Job Content

Occupations	Skills Required (1) Percent of Firms			Time to Achieve Proficiency (1) Percent of Firms			Knowledge of Firm's Operations (1) Percent of Firms		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	66	0	34	20	0	79	47	0	53
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	75	0	25	50	0	51	66	0	35
• Engineering Technicians and Technologists	85	0	15	70	0	30	44	0	56
• Systems Analysts and Computer Programmers	71	0	29	36	0	64	81	0	19
PROCESSING	12	1	88	12	0	88	12	0	88
MACHINING									
• Tool and Die Making	1	1	98	1	0	99	0	0	100
• Machinist and Machine Tool Tool Setting-Up	100	0	0	50	0	50	13	0	87
• Machine-Tool Operators	0	22	78	0	21	79	0	21	79
• Metal Shaping and Forming	0	100	0	0	49	51	0	49	51
• Filing, Grinding, Buffing, Cleaning and Polishing	48	1	52	0	0	100	0	0	100
FABRICATING, ASSEMBLING AND REPAIRING									
• Fabricating and Assembling Metal Products	0	0	100	41	0	60	0	0	100
• Industrial Machinery Mechanics and Repairmen	100	0	0	59	0	41	50	0	51
MATERIALS HANDLING AND RELATED	0	0	100	0	0	100	0	0	100

+ increase - decrease 0 remain the same
(1) Non-responses excluded.

5.3 Likely Steps to Deal with Skills Shortages

Recruiting new employees is stated as the primary method for dealing with skill shortages in most occupations. Retraining is the second most important measure cited by respondents. Other possible steps include contracting for machinery repair and upgrading for several occupations, especially Processing. Table 13 records respondents' views.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on selected occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firm's operations.

Skill requirements are expected to increase in response to the introduction of new technology for Managerial and Natural Sciences occupations. Respondents expect little or no change in most occupations in Processing, Machining, Fabricating and Materials Handling with two exceptions. Respondents expect that an increase in skills will be necessary for machinists, and industrial machinery mechanics. Only for metal shaping and forming do they expect that necessary skills acquisition will decline (see Table 14).

Time requirements are expected to increase on balance for most occupations. Only for metal shaping and perhaps machine tool operating will a reduction in time requirements be possible.

Similar views are held by respondents regarding the effect of new technology on required knowledge of the firm's operations. Increased knowledge is expected to be necessary in Managerial and Natural Sciences occupations as well as for industrial machinery mechanics. "No change" is the expected effect of technological

change elsewhere except for metal shaping and forming workers, whose knowledge requirements are expected to decline.

Thus, skill, time and knowledge requirements are expected to move together for most occupations. Increases are projected in Managerial and Natural Science tasks and no change is expected elsewhere except for declines in machine tool and metal shaping work and increases in industrial machinery repair.

5.5 Training Costs and New Technology

Training costs are a small proportion of labour expenditures for most of the industry. Average training outlays amount to about 2 percent of total labour costs and are projected to rise very little in the years to 1990. Firm size does not appear to be a significant influence on the training cost share of labour costs.

The new technology component of training costs is about 22 percent according to survey respondents and future increases to about 32 percent are expected for the period 1990 to 1995. Large and medium sized firms plan to spend considerably more on new technology as a share of training costs (up to 60 percent) than small firms (under 10 percent).

Respondents also draw attention to the wide variation in training time and costs required to retrain for various occupations. Some occupations may require a year or more of formal retraining and on the job experience before proficiency is attained as some workers have difficulty adjusting to the new quality of workmanship that is demanded of them when using new machinery.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

In the Metal Stamping, Pressing and Coating Industry, 14,265 employees or 80 percent of the 17,730 total employees have collective bargaining agreements with their employers. The major unions are the United Steelworkers which represents 37 percent of total unionized employees and the Auto Workers which represents another 21 percent (see Table 15). The remainder are represented by a wide variety of unions as follows:

- CLC Chartered Agreements
- Independent Locals
- Sheet Metal Workers
- Machinists
- Graphic Communications
- Boilermakers
- Canadian Operating Engineers
- Food and Commercial Workers
- Carpenters
- Christian Labour Association
- Public Service Alliance
- United Electrical Workers
- Labourers
- Teamsters

6.2 Trends in Unionization

Respondents estimate that about 37 percent of firms have union representative for at least some of their employees. About 50 percent of small firms and all large firms are expected to have some union representation. In contrast, just 14 percent of medium sized firms have a union present. Among unionized firms

TABLE 15

INDUSTRIAL RELATIONS: METAL STAMPING, PRESSING AND COATING INDUSTRY

UNION	NUMBER OF MEMBERS	MAJOR EMPLOYER*	LOCATION	TECHNOLOGICAL CHANGE CLAUSES
UNITED STEELWORKERS	2,000	Continental Can Co. of Canada	Intercity	Advance Notice, Consultation, Training, Transfer Arrangements
	308	ITT Aimco Division	Mississauga & Toronto	None
	240	Crown Cork & Seal Co.	Concord	None
	277	Westeel-Rosco	Toronto	None
	235	Vulcan Industrial Packaging Ltd.	Etobicoke	None
	230	Rheem Canada Limited	Hamilton	None
UNITED AUTO WORKERS	639	TRW Canada United - Carr Division	Brantford	None
	470	Fabricated Steel Products	Windsor	None
	400	Butler Metal Products & Butler Polymet	Cambridge	Advance Notice, Training, Joint Automation Committee
	385	Firestone Steel Products of Canada	London	None
CLC DIRECTLY CHARTERED	1,200	American Can Canada Inc.	Hamilton & Simcoe	None
INDEPENDENT LOCAL	420	Tridon Ltd.	Region of Halton	None
	300	Supreme Aluminum Industries	Scarborough & Pickering	None
MACHINISTS	266	Richards-Wilcox of Canada	London	None
	200	Canadian Canners Limited	Burlington	Advance Notice, Training, Transfer Arrangements
PUBLIC SERVICE ALLIANCE	283	Royal Canadian Mint	Ottawa	Advance Notice, Consultation, Training, Relocation Allowances, Transfer Arrangements

* Employer with a union agreement covering 200 or more employees. The union agreements above represent 55 percent of unionized employees.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

about 77 percent of employees are unionized at present. A slight decline to around 74 percent is projected by 1995, with declines concentrated in the small firms.

6.3 Technology Change Clauses

Respondents indicate that technology change clauses are fairly widespread among firms with unions. Such clauses appear in 67 percent of the union contracts. These clauses make provisions for advance notice and consultation in 40 percent of the firms with technology change clauses.

Ontario Ministry of Labour information covering firms with more than 200 employees is available to supplement the survey on this subject.

The major union agreements in the industry are with employees such as Continental Can Co. of Canada, American Can Canada Inc. and TRW Canada United. Of the 16 larger agreements listed in Table 15, only 4, or 25 percent have clauses dealing with the adoption of new technology. The most common clauses deal with the issue of:

- advance notice of the introduction of a new technology,
- training of employees affected by technological change, and
- transfer arrangements for an employee to another workplace if displaced by technology.

Other clauses include consultation with management prior to the introduction of a technological change, the formation of a joint automation committee to study and discuss the problems created by technological change and relocation allowances incurred in the transfer to another job or location.

6.4 Management's Perception of their Union's Position on New Technology

Firm executives view union leadership as in a period of transition towards greater acceptance of technological changes than was the case in the past. They note that attitudes may vary widely even with respect to one firm, some union leaders being accommodating and others making technological change an occasion for extensive bargaining. However, executives think that understanding of the need for change is growing. In fact, some firms record union views as being very constructive towards the introduction of new technology, anticipating benefits to their membership from contact with innovations.

These views are confirmed by union responses to the same question. Some express caution about the potential effects of innovation, having concerns about membership declines, wage declines and lack of union input in technical change decisions. However, others stress the importance of new technology introduction for competitiveness and cost control. Union leaders place training opportunities for current members as a significant concern.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Working involvement in production decisions increases as the size of the operating unit decreases. At the company and division level less than 20 percent of the industry reports having formal mechanisms for this purpose but the proportion grows to about 50 percent for department level decisions and about 60 percent for working group decisions.

Formal mechanisms for worker participation in productivity and quality decisions exists in about 66 percent of the industry, making this area the one with the most widespread employee involvement. In contrast, new technology adoption questions get formal action in only about 20 percent of the industry.

The survey reports that medium sized firms have the highest average percent of formal mechanisms in most areas, with small and large firms at much lower levels. In particular, large firms do not report having formal mechanisms at any level for production or sales decisions.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked to what extent management should involve workers in decisions regarding the adoption of new technologies.

About 20 percent of firms in the industry appear to believe in the fullest possible involvement for workers in the process of innovation. An important component cited by about 30 percent of the industry is the advisability of prior consultation on the introduction of new machinery in order to ensure that employees are given as much information as far in advance of proposed change as possible thereby permitting time for worker adjustments. Another aim is to obtain workers' views on current production techniques so as to properly define the problems that new technology might help to solve.

Similar themes are evident among firms with more limited views than those who advocate full involvement. The importance of keeping employees informed is stressed by some respondents, including potential effects on job security. Others focus on training programs as being a key ingredient in properly dealing with technological change.

Management attitudes may be affected in part by employee skill levels and sense of responsibility to the firm. Respondents appear to view skilled workers as having views which may be important for future decisions while unskilled workers may not be consulted to the same degree. This conclusion is qualified by possible differences in management views across firms as to what degree of knowledge constitutes qualification to participate in technology change decisions.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of theses results appears in Table 16.

The industry makes widespread use of strategic planning. Human resource planning is less common in the industry, in use by only about 25 percent of firms. Large firms lead in adopting this type of planning. The planning horizon for anticipating occupational needs is estimated by the survey respondents to be about four years on average.

Capital investment planning to introduce new technology is widespread. About 58 percent of the industry has such plans, with the percentage of firms increasing with firm size. Again, the planning horizon is estimated to be about four years.

Integration between human resource and capital investment plans also increases with firm size. Large firms have highly integrated planning in comparison with small and medium sized firms. However, the industry average is a relatively low level of integration.

Results of Question 18

TABLE 16: METAL STAMPING, PRESSING AND COATING INDUSTRY — SIC 304

Planning for Technological Change

Firms by Employment Size	Strategic Plan: Percent of Firms With Plan	Human Resource Plan: Percent of Firms With Plan	Human Resource Plan: Length of Planning Horizon	Capital Investment Plan: Percent of Firms With Plan	Capital Investment Plan: Length of Planning Horizon	Perceived Integration Between Capital and Human Plans (1)
Small (20-99)	75	25	5 years	50	4 years	1.7
Medium (100-499)	63	25	3 years	71	5 years	2.3
Large (500+)	100	100	5 years	100	5 years	5.0
Total Firms	70	25	4 years	58	4 years	2.0

1. Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

SECTION II - HARDWARE, TOOL AND CUTLERY MANUFACTURING INDUSTRY

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of trends in the Hardware, Tool and Cutlery Manufacturing Industry for the period 1971 to 1981 and 1982 to 1984. In 1982, the Hardware, Tool and Cutlery Manufacturing Industry in Ontario included 652 establishments with $736 million of manufacturing shipments. This industry accounted for about 21 percent of the total manufacturing shipments of SIC's 304, 306 and 309 combined. As such, hardware, tool and cutlery manufacturers are the smallest of the three types of metal fabricating operations under consideration in this report; however, this segment of the industry claims more establishments than either of the other two metal fabricating industries.

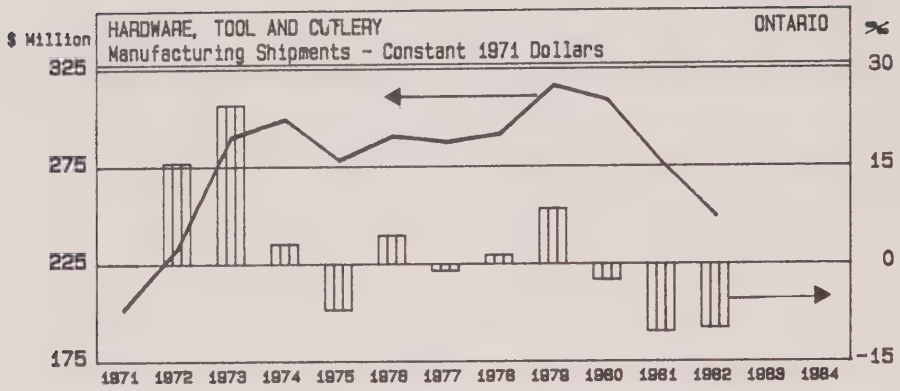
The Hardware, Tool and Cutlery Industry includes establishments such as Amerock Inc., H. E. Vannatter Ltd., and Omark Canada Ltd. These and the other establishments included in SIC 306 are primarily engaged in manufacturing edge and hand tools, cutlery and hardware. Products of this industry are listed in order of importance in Table D9. Dies and moulds represented 21.2 percent of manufacturing shipments in 1981 followed by builders' and shelf hardware and hand tools. This industry also includes establishments primarily engaged in manufacturing bits, drills, (except rock drill bits) and other cutting tools for machines or for power-driven hand tools. Establishments primarily engaged in the manufacture of sterling silver, silver-plated cutlery, machine tools, power-driven hand tools and of machinists precision tools are not included in SIC 306 and instead are included elsewhere.

2.1 Industry Trends

Tables D10 to D13 present key industry indicators for the years 1971 to 1984.

2.1.1 Aggregate Output

EXHIBIT 8



Manufacturing shipments of the Hardware, Tool and Cutlery Manufacturing Industry increased from $201.3 million in 1971 to $740.1 million in 1981 in current dollars. In constant 1971 dollars, shipments increased from $201.3 million to $276.0 million over the 1971 to 1981 period, recording an average annual rate of real growth of 3.2 percent.

Real growth in shipments in this industry was more rapid on average than real growth in the other two segments of the metal fabricating industry that are under consideration. Nonetheless, growth rates were somewhat uneven over the course of the decade. Strong real increases in shipments in the early 1970's were followed by downturns in 1975 and again in 1977. Although shipment activity regained strength in 1978 and reached peak constant 1971 dollar levels in 1979, weak markets and the general economic recession of 1981-1982 caused shipments to decline sharply in the early 1980's.

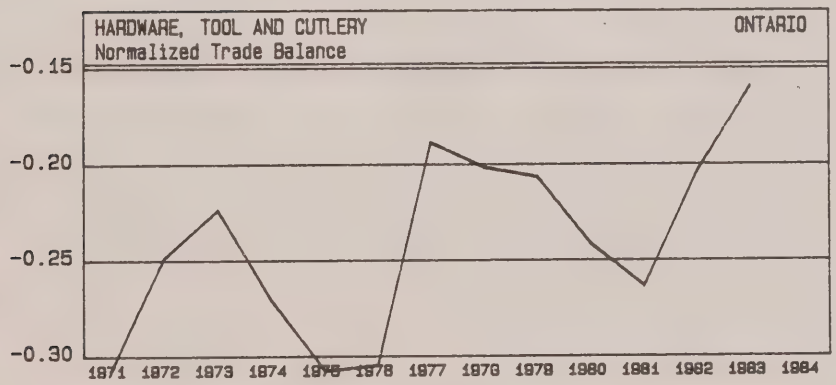
From 1981 to 1982, current dollar shipments declined from $740.1 million to $736.4 million, a 0.5 percent decrease in

activity. In constant 1971 dollars, shipments fell 9.8 percent from $276.0 million to $248.8 million over the same period.

2.1.2 Competitive Position

Since 1971, the value of Ontario's imports of hardware, tool and cutlery products has exceeded the value of exports by slightly less than a two-to-one ratio on average. Exhibit 9 below shows Ontario's normalized trade balance (exports minus imports divided by exports plus imports) for the Hardware, Tool and Cutlery Manufacturing Industry. The chart indicates that Ontario's normalized trade balance fluctuated dramatically over the period 1971 to 1981, trending upward in the period 1981 through 1983. The gradual upward trend indicates that Ontario's negative trade balance as a percent of total trade has been declining.

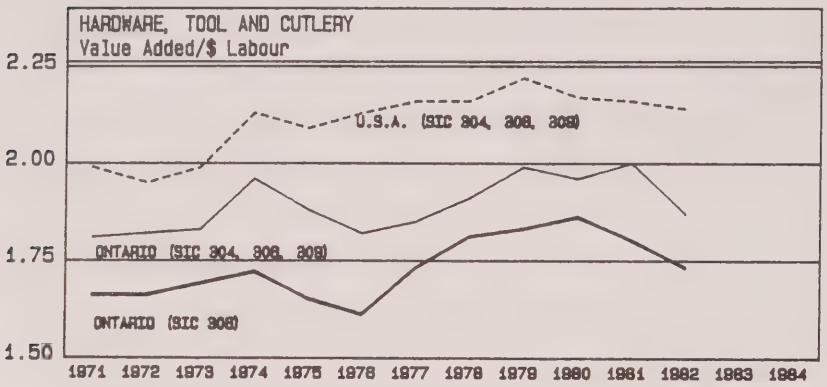
EXHIBIT 9



As with the Metal Stamping, Pressing and Coating Industry, value added per dollar of labour data is available for the Hardware, Tool and Cutlery Industry in Ontario. However, in the United States, comparable data is only available for SIC's 304, 306, and 309 combined. Thus, one can only examine the performance of SIC 306 in Ontario relative to SIC's 304, 306 and 309 combined in Ontario and in the United States.

Exhibit 10 illustrates that value added per dollar of labour was consistently higher for the three SIC's combined in the United States than for SIC 306 or the three SIC's combined in Ontario over the period 1971 to 1982. As well, value added per dollar of labour in Ontario was lower in SIC 306 than in SIC's 304, 306 and 309 combined.

EXHIBIT 10



Value added per dollar of labour for SIC 306 gradually trended upward over the period 1971 to 1980. Declines in 1981 and 1982 dragged the measure back down to 1977 levels. In the United States, the declines in value added per dollar of labour for SIC's 304, 306 and 309 began earlier - in 1980 - but were much less severe than in Canada.

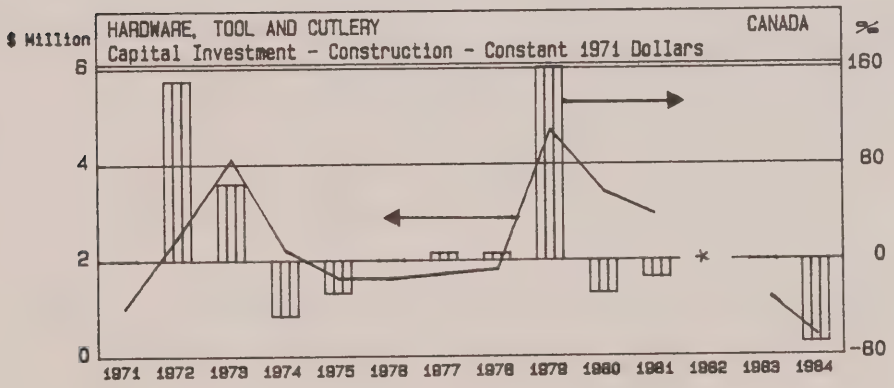
2.1.3 Capital Investment

Capital investment statistics are only available for Canada as a whole for SIC 306; however, in 1982, Ontario based manufacturers in the Hardware, Tool and Cutlery Industry accounted for 76.5 percent of total Canadian shipments of these products.

Total capital spending by hardware, tool and cutlery manufacturers increased from $7.9 million in 1971 to $40.3 million in 1981 in current dollars. In the 1982 to 1984 period, total capital spending fell to a low of $21.6 million in 1982 and $17.8 million in 1983. In 1984, capital spending is expected to increase again to $21.1 million.

In constant 1971 dollars, capital spending by the Hardware, Tool and Cutlery Industry increased sharply to a temporary peak of $15.8 million in 1973 before falling off through the mid 1970's. Capital spending then turned sharply upward again in 1978 and 1979, reaching a peak for the decade at $21.8 million in 1980. During the early 1980's, the cancellation of several major energy investment projects combined with the 1981-1982 economic recession caused total capital spending to fall to new lows for the decade by 1983. In 1984, a pick-up in machinery and equipment spending is expected to cause a 12.1 percent increase in total capital spending for the Hardware, Tool and Cutlery Manufacturing Industry.

EXHIBIT 11

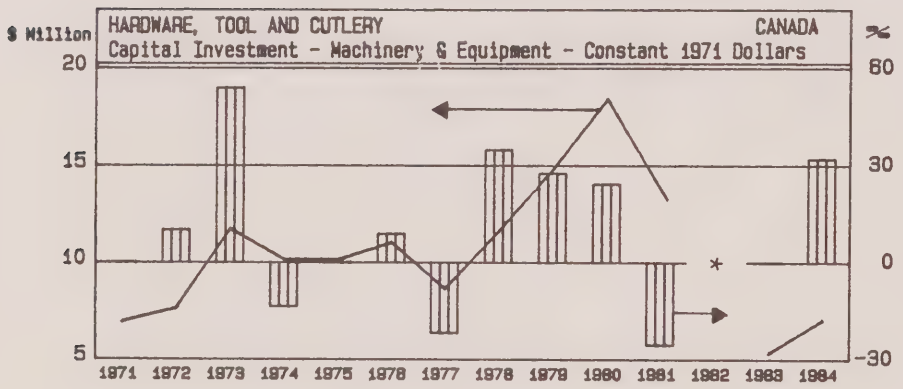


* 1982 data is secured (see Tables D10 to D13)

Machinery and equipment spending was by far the larger of the two components of capital spending during the 1970's. In current dollars, capital spending on machinery and equipment was $6.9 million in 1971 and $33.2 million in 1981. By comparison, capital spending on construction was $1.0 million in 1971 and $7.1 million in 1981.

In constant 1971 dollars, capital spending on machinery and equipment increased from $6.9 million to $13.7 million over the 1971 to 1981 period. The corresponding figures for construction were $1.0 million and 2.9 million. Capital spending on construction therefore increased at an average annual rate of 11.2 percent from 1971 to 1981 while machinery and equipment increased less rapidly, averaging increases of 7.1 percent.

EXHIBIT 12



* 1982 data is secured (see Tables D.10 to D.13)

Capital investment statistics are not available for the construction and machinery and equipment components of SIC 306 in 1982. Nonetheless, over the 1982 to 1984 period, it is clear that capital spending turned sharply downward. In

1984, machinery and equipment spending in constant 1971 dollars is expected to record a 32.1 percent increase; however, construction spending is forecast to decline by 69.2 percent.

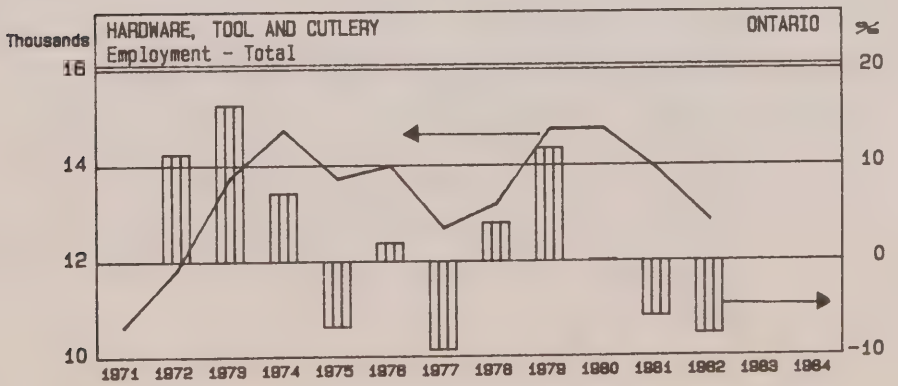
2.1.4 Employment

The discussion of employment for the Hardware, Tool and Cutlery Industry includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

  In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the Census of manufacturing industries conducted by Statistics Canada annually. This data series is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this data is only available for the census years of 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

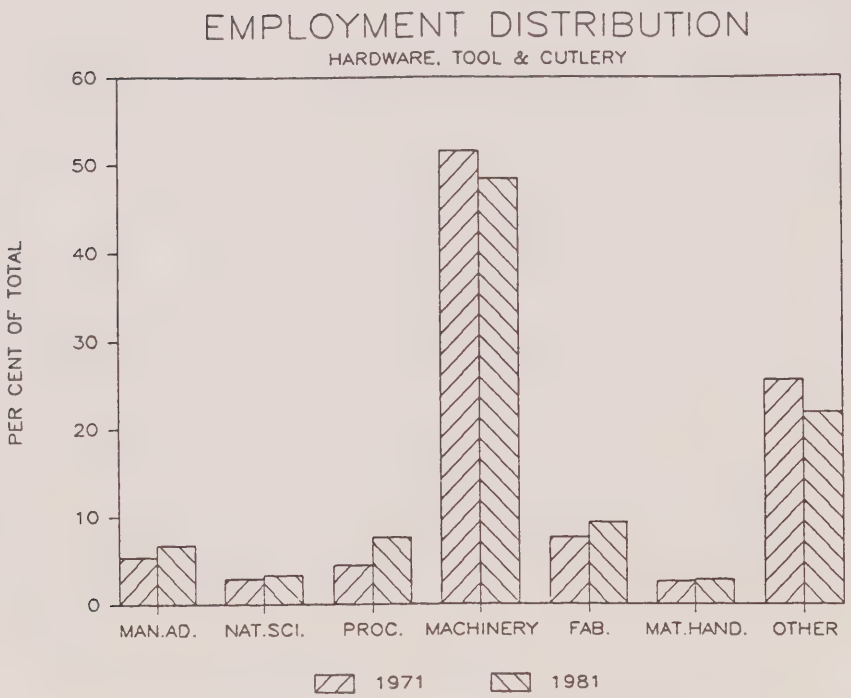
EXHIBIT 13



In 1982, 12,826 persons were employed in SIC 306. This compares to 13,893 employees in 1981 and 10,621 employees in the industry in 1971. Total employment in the Hardware Tool and Cutlery Industry in Ontario increased at an average annual rate of 2.7 percent over the 1971 to 1981 period. In 1982, employment declined by 7.7 percent over 1981 levels.

- Occupational Changes

EXHIBIT 14



Census data for Ontario show that total employment in the Hardware, Tool and Cutlery Manufacturing Industry increased at an average annual rate of 5.5 percent from 1971 to 1981. Of the seven major occupational groups shown in Exhibit 14, two - Machining and Related and All Other occupations - experienced a decline in their share of total employment over the decade. All the remaining occupational groups increased their share of total employment from 1971 to 1981.

Analysis at the broad occupational level in Table D.14 indicates that Processing experienced the most rapid average annual increases in numbers employed from 1971 to 1981. Processing, however, only accounted for 7.6 percent of total employment in SIC 306 in 1981. Machining and Related by contrast is the largest occupational category in SIC 306, accounting for 9,085 jobs or 48.5 percent of total employment in 1981; however, this occupational group experienced the slowest average annual growth at 4.9 percent from 1971 to 1981.

Analysis at the more detailed occupational level indicates that metal processing and related, production management and sales and advertising management positions experienced the most rapid average annual growth rates - of 20 percent or more - from 1971 to 1981. These occupational groups were however, small, accounting for a combined total of 4.2 percent of total employment in SIC 306 in 1981. Occupational groups experiencing average annual growth rates of 2.0 percent or less included general managers and other senior officials, filing, grinding, buffing, cleaning and polishing and machine-tool operating. The first two occupations accounted for 1.1 and 2.6 percent respectively of total employment in 1981; however, the machine-tool operators accounted for nearly 6.0 percent of total employment in that year.

The largest detailed employment category - tool and die-making - accounted for 3,120 jobs or 16.6 percent of total employment and grew at an average annual rate of 5.2 percent from 1971 to 1981 - just below the industry average of 5.5 percent.

Analysis by sex in Table D.15 shows that female employment as a percent of total employment in SIC 306 increased from 19.6 percent in 1971 to 21.2 percent in 1981. Over 1,800 jobs were gained by females over the period, causing female employment in the industry to total 3,975 jobs in 1981.

All the major broad levels of occupations experienced an increase in female employment as a percent of total employment except Material Handling and Related. Female employment fell from 73.2 percent of total employment in 1971 to 44.8 percent in 1981 in this occupational category. Also, this category only gained 30 jobs from 1971 to 1981. Nonetheless, Material Handling and Related continued to claim the highest proportion of females of any broad occupational group in 1981.

Female employment as a percent of total employment was lowest in the Machining and Related and Natural Sciences, Engineering and Mathematics occupations at 8.9 percent and 8.1 percent respectively in 1981. However, the Machining and Related group gained the most jobs for women - 340 - of any broad occupational group from 1971 to 1981.

Analysis at the four digit occupational level indicates that the other fabricating and assembling of metal products group gained the most jobs for women from 1971 to 1981 - 175 jobs. Female employment as a percent of total employment was 57.7 percent in 1981 compared to 52.5 percent in 1971 in this occupational category.

Female employment as a percent of total employment in 1981 was highest in the packaging, not elsewhere classified (75.4 percent) and the electrical equipment fabricating and assembling (72.0 percent) occupations. These two groups accounted for 5.4 and 2.3 percent of total female employment in SIC 306 in 1981.

In absolute terms, the largest gains in SIC 306 - 280 jobs - were in the other fabricating and assembling of metal products category. By contrast, no female jobs existed in the architectural and engineering technologists and technicians, general managers and other senior officials, production management, industrial, farm and construction machinery mechanics and repairmen and patternmakers and mouldmakers occupations.

Results of Question 3

TABLE 17: HARDWARE, TOOL AND CUTLERY INDUSTRY

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985			1985-1990			1990-1995		
	Small	Medium	Total	Small	Medium	Total	Small	Medium	Total
1. DESIGN TECHNOLOGIES									
Computer-Aided Design (CAD)	0	0	0	50	83	59	50	17	41
Computer-Aided Engineering (CAE)	0	0	0	-	40	12	33	20	30
CAD/CAM Integration	0	0	0	67	17	50	67	50	61
2. MANUFACTURING PLANNING AND CONTROL SYSTEMS									
Computerized Financial Systems	80	100	85	20	17	19	20	-	16
Computerized Order Entry/Inventory Control	50	67	54	50	33	46	25	-	18
Computer-Aided Process Planning	0	0	0	80	100	85	40	-	31
Manufacturing Resource Planning Systems (MRP)	0	40	9	25	60	33	25	-	19
Automated Shop Floor Data Collection	0	20	4	40	80	48	40	-	32
Computerized Decision Support Systems	0	20	5	50	60	52	25	-	19
Computerized Maintenance Planning and Control	0	0	0	25	80	38	25	-	19
3. MANUFACTURING PROCESS TECHNOLOGIES									
Numerically Controlled Machines (NC)	100	67	91	25	33	27	-	-	-
Computer Controlled CN Machines (CNC)	50	67	54	50	67	54	25	-	18
CAD Directed CNC	20	0	16	40	67	46	80	17	66
Computerized Process Control Systems	0	40	9	50	40	48	25	-	19
Computer-Aided Inspection and Testing	0	17	4	60	50	58	40	17	35
Robotic Applications	0	40	12	-	60	17	-	20	6
Flexible Manufacturing Technologies	0	0	0	25	33	27	25	50	32
Computer Integrated Manufacturing (CIM)	25	0	18	25	33	27	25	50	32
4. MATERIALS HANDLING TECHNOLOGIES									
Automatic Bulk Handlers/Feeder Systems	0	0	0	-	-	-	-	20	6
Automated Conveyor/Vehicle Systems	25	0	19	25	20	24	-	20	5
Automated Storage and Retrieval	0	0	0	-	20	5	25	20	24
Computer Controlled Conveyor/Vehicles	0	0	0	-	20	6	-	20	6
Automated Warehouse	0	0	0	-	20	5	25	20	24
5. TELECOMMUNICATIONS TECHNOLOGIES									
Facsimile (FAX) Link: HO/Plant(s)	0	60	14	25	20	24	-	20	5
Computer Link: HO/Plant(s)	20	50	27	40	50	42	-	-	-
Computer Link: Suppliers/Customers	0	20	5	75	80	76	-	-	-
6. OTHER TECHNOLOGIES	25	0	19	25	-	19	-	-	-

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for periods 1985-1990 and 1990-1995 to indicate respondents, at the time of survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

PART III - FUTURE TRENDS: SURVEY RESULTS

Part III of this study presents the survey results which discuss surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Hardware, Tool and Cutlery Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The industry has in place a variety of innovations in the areas of manufacturing planning and control, manufacturing processes and telecommunications. Within these groups, medium sized firms have introduced a broader range of new technologies than have small firms.

In the next ten years the industry plans to deepen its investment in the areas where new technology has already been adopted and to broaden its investment by purchasing in the areas of design technologies and materials handling. By 1995 most new technologies except perhaps those in material handling will have been widely adopted by the industry. Table 17 illustrates, for each type of new technology, what percentage of the industry has adopted or will adopt in the future.

3.1.1 Design Technologies

Although no new design technologies have been adopted as yet, firms plan extensive purchases in the next ten years. For example 59 percent of the industry is expected to purchase computer assisted design (CAD) equipment by 1990.

Small firms will lag medium sized firms. A higher percentage of medium firms will purchase CAD and computer assisted engineering (CAE) equipment than small sized firms in the 1985 to 1990 period, while the relationship is revised for the years 1985 to 1990. Both groups plan to integrate a larger share of CAD equipment with computer assisted manufacturing (CAM) processes.

3.1.2 Manufacturing Planning and Control Technologies

Financial systems and order entry are already computerized in large part. Medium sized firms are also beginning to use computers for decision support, to automate shop floor data collection and use resource planning. They plan to continue purchasing these technologies plus others in planning and control to 1990. Small firms will follow, spreading their purchases out to 1995.

3.1.3 Manufacturing Process Technologies

Numerically controlled machines are being used by over 90 percent of the industry at present and over 50 percent are using computerized versions (CNC). As well, computers are being used in such tasks as process control and inspection and testing.

Again, the industry plans to adopt a broad range of process technologies in such areas as computer integrated manufacturing and flexible manufacturing. Medium sized firms are expected to lead small firms in adoption rates to some degree. Robots are projected to be used exclusively by medium sized firms, with steady purchasing being done up to 1995 to augment current use by 40 percent of the group surveyed.

3.1.4 Materials Handling Technologies

The industry plans to take limited advantage of

innovations in material handling. Each technology listed in the table will see purchases by less than 25 percent of the industry in both 1985 to 1990 and 1990 to 1995.

3.1.5 Telecommunications Technologies

The industry is beginning to use computer and facsmile (FAX) links between plant and head office. These links will be established or extended by much of the industry in the next ten years. However, the focus of interest in the 1985 to 1990 period will be linking firms by computer with their suppliers and customers. An estimated 76 percent of the industry will adopt some new technology for this purpose during that time.

3.2 Forces Driving the Need to Adopt New Technologies

Firms identify their predominant influences inducing technological change as:

- competitive pressures,
- customer demands for change, and
- the need to lower costs.

Respondents cite desires for high quality products or products machined to higher tolerances than previously as the major aspect of demands for change by customers. Unless these demands can be satisfied a firm will not be qualified to compete for business.

New technology can lower costs in several ways, in the industry's opinion. A new machine technique can boost productivity, making work effort by employees go farther than before and lowering unit costs. Furthermore, it can attract a better quality of employee and make work potentially more enjoyable than it otherwise would be. However, the scope for reducing labour costs for a given level of production is limited in many of these firms because labour costs are a relatively small proportion of total costs. Survey results are presented in Table 18.

Results of Question 4

TABLE 18: HARDWARE, TOOL AND CUTLERY INDUSTRY SIC 306

Most Important Factors Driving the Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size		
		Small (20-99)	Medium (100-499)	Total Firms
COMPETITIVE PRESSURES	First	40	33	39
	Second	20	0	15
	Third	0	0	0
	Weighted Importance (1)	1.6	1.0	1.5
STRATEGIC	First	0	17	4
	Second	0	0	0
	Third	40	0	31
	Weighted Importance	0.4	0.5	0.4
INCREASE QUALITY	First	0	0	0
	Second	20	33	23
	Third	0	0	0
	Weighted Importance	0.4	0.7	0.5
CUSTOMER DEMANDS FOR CHANGES	First	40	17	35
	Second	0	17	4
	Third	0	0	0
	Weighted Importance	1.2	0.8	1.1
INCREASE PROFITABILITY	First	0	0	0
	Second	0	33	8
	Third	20	0	16
	Weighted Importance	0.2	0.7	0.3
INCREASE PRODUCTIVITY	First	0	0	0
	Second	20	17	19
	Third	0	0	0
	Weighted Importance	0.4	0.3	0.4
INCREASE MANAGEMENT INFORMATION	First	0	0	0
	Second	20	0	16
	Third	0	0	0
	Weighted Importance	0.4	0.0	0.3
LOWER COSTS	First	20	33	23
	Second	20	0	16
	Third	0	17	4
	Weighted Importance	1.0	1.2	1.0
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0	0	0
	Second	0	0	0
	Third	20	33	23
	Weighted Importance	0.2	0.3	0.2
ENTER NEW MARKETS/ GROWTH	First	0	0	0
	Second	0	0	0
	Third	0	17	4
	Weighted Importance	0.0	0.2	0.0
ALL OTHERS	First	0	0	0
	Second	0	0	0
	Third	0	17	4
	Weighted Importance	0.0	0.2	0.0

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 19: HARDWARE, TOOL AND CUTLERY INDUSTRY SIC 306

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size		
		Small (20-99)	Medium (100-499)	Total Firms
ABILITY TO FINANCE	First	20	17	19
	Second	0	0	0
	Third	0	33	8
	Weighted Importance (1)	0.6	0.8	0.7
COST OF NEW TECHNOLOGY	First	20	0	16
	Second	20	33	23
	Third	0	0	0
	Weighted Importance	1.0	0.7	0.9
LACK OF GOVERNMENT ASSISTANCE	First	0	0	0
	Second	0	0	0
	Third	20	0	16
	Weighted Importance	0.2	0.0	0.2
COMPETITIVE ENVIRONMENT	First	20	50	27
	Second	20	0	16
	Third	0	0	0
	Weighted Importance	1.0	1.5	1.1
POOR ECONOMIC CONDITIONS	First	20	33	23
	Second	40	17	35
	Third	0	0	0
	Weighted Importance	1.4	1.3	1.4
UNION RESISTANCE	First	0	0	0
	Second	0	17	4
	Third	0	0	0
	Weighted Importance	0.0	0.3	0.1
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	20	0	16
	Second	0	0	0
	Third	0	17	4
	Weighted Importance	0.6	0.2	0.5
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0	0	0
	Second	20	0	16
	Third	0	0	0
	Weighted Importance	0.4	0.0	0.3
ALL OTHERS	First	0	0	0
	Second	0	33	8
	Third	0	0	0
	Weighted Importance	0.0	0.7	0.2

(1) Weighted Importance = (First % x 3) + (Second % x 2) = (Third % x 1)

3.3 Factors that Could Slow the Rate of Technology Adoption

The industry lists four major influences which could potentially retard the rate of new technology adoption. These are:

- poor economic conditions,
- competitive environment,
- cost of new technology, and
- the ability to finance its purchases.

Poor economic conditions are important due to their negative influence on profits and the ability to finance investment. Such conditions produce a competitive market environment because of slow sales growth. Respondents indicate that this growth is necessary to make future acquisition of new technology profitable. Another aspect of the market environment for some is the increasing competition that they face from offshore.

Cost has several components as a potential retarding factor inherent in new technology acquisition. Not only can machinery be expensive, but also training can be a problem. A firm may put a worker through a lengthy training program only to see him leave for a better paying position. Furthermore, some firms may need a certain new machine for a single contract with little or no potential for more work in that area. Under such circumstances expenditures for training employees and acquiring new machinery may become prohibitive. As well, management often must spend a good deal of time researching new equipment purchases and this can be a cost element which retards acquisition.

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the industry in terms of aggregate output (i.e. manufacturing shipments in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Hardware, tool and cutlery manufacturing output has rebounded strongly from the real declines during 1981 and 1982. Respondents estimate that shipments will expand by about 6.5 percent in 1985 following 9 percent growth in 1984. The industry expects growth to moderate in the years to 1995, averaging 5 percent per annum to 1990 and 3 percent a year from 1990 to 1995.

4.2 Investment Patterns

Respondents indicate that they expect investment expenditures to be evenly divided between construction and machinery and equipment. However, about 66 percent of machinery and equipment expenditure is projected to have a new technology component while almost none of the construction expenditure will bear any direct relationship to technological change.

4.2.1 Justifying Financial Investment in New Technology

New technology investment is subjected to formal tests of profitability. Medium sized firms appear to require a return an investment of about 31.5 percent to justify the application of funds. Small firms responding to this question require a return exceeding the Bank Rate. About 72 percent of the industry uses an ROI criterion, while about 68 percent use a pay-back period criterion. Those who use a pay-back rule expect investment to pay for itself within about 4 years. Table 21 presents the survey results.

Results of Question 1

TABLE 20: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Manufacturing Shipments in Ontario

(1)

Firms by Employment Size	Average Annual Compound Rate of Change (in Constant Dollars)				
	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	0.5	9.0	7.0	5.6	3.0
Medium (100-499)	-2.0	9.0	5.0	2.5	3.0
Total Firms	0.0	9.0	6.5	5.0	3.0

(1) Rounded to closest 0.5%

Results of Question 17e

TABLE 21: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period		Return on Investment	
	% of Firms Using Pay-Back	Average Period	% of Firms Using ROI	Average Rate
Small (20-99)	60	5.0	80	*
Medium (100-499)	100	2.2	40	31.5
Total Firms	68	4.2	72	**

Answers not mutually exclusive.
* ROI must exceed bank rate to justify investment (views of 50 per cent of respondents; others did not reply).
** Cannot be calculated.

Results of Question 17f

TABLE 22: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Source of Funds for New Technology Spending

Firms by Employment Size	Internal Funds	External Funds
	Percent	Percent
Small (20-99)	66	34
Medium (100-499)	85	15
Total Firms	70	30

Results of Question 11a,b,c

TABLE 23: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size: Small (20-99)	Medium (100-499)	Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0	17	4
	Second	0	17	4
	Third	25	0	18
	Weighted Importance (1)	0.3	0.8	0.4
INCREASE SALES/ INCREASE MARKET SHARE	First	25	33	27
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.8	1.0	0.8
INTRODUCTION OF NEW TECHNOLOGY	First	0	17	4
	Second	0	17	4
	Third	0	17	4
	Weighted Importance	0.0	1.0	0.3
SUCCESS IN FOREIGN MARKETS	First	0	0	0
	Second	0	0	0
	Third	0	17	4
	Weighted Importance	0.0	0.2	0.0
AVAILABILITY OF NECESSARY SKILLS	First	25	0	18
	Second	25	17	23
	Third	0	17	4
	Weighted Importance	1.3	0.5	1.1
ABILITY TO COMPETE	First	25	0	18
	Second	0	33	9
	Third	0	0	0
	Weighted Importance	0.8	0.7	0.7
INDUSTRY-WIDE GROWTH	First	25	33	27
	Second	25	0	18
	Third	0	0	0
	Weighted Importance	1.3	1.0	1.2
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	0	0	0
	Second	0	0	0
	Third	0	17	4
	Weighted Importance	0.0	0.2	0.0
PRODUCT DIVERSIFICATION	First	0	0	0
	Second	0	17	4
	Third	0	0	0
	Weighted Importance	0.0	0.3	0.1
ALL OTHERS	First	0	0	0
	Second	0	0	0
	Third	0	33	9
	Weighted Importance	0.0	0.3	0.1

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

4.2.2 Sources of New Capital Spending

The industry expects to finance abut 70 percent of its planned investment from internal funds and about 30 percent from external funds. Small firms will rely more on external funds than will medium sized firms. Table 22 provides the survey results.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

The industry identifies four main factors determining employment levels:

- industry-wide growth,
- availability of necessary skills,
- sales, and
- ability to compete.

Respondents attach primary interest to influences on market conditions for their firms' or industry's products but emphasize that their growth and hiring opportunities will be limited if they are unable to supply their product at suitable quality levels and on time. Respondents, views are presented in Table 23.

Results of Question 11d

TABLE 24: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	2.0	8.5	3.5	2.0
Medium (100-499)	-2.5	3.0	1.5	0.0
Total Firms	-0.5	5.5	2.5	1.5

(1) Rounded to closest 0.5%.

4.3.2 Employment Outlook

The industry expects employment to grow by 5.5 percent in 1985 after a modest decline in 1984 of 0.5 percent. Respondents expect growth of about 2.5 percent a year between 1985 to 1990 and about 1.5 percent in the period 1990 to 1995 (see Table 24).

A comparison with the industry's views on shipments growth shows that most firms expect slightly lower employment growth than constant dollar shipments growth. This may be interpreted as firm's anticipating modest gains in labour productivity.

4.3.3 Trends in Part-Time Work

Part-time employment is currently insignificant in the industry. No trend towards increases was identified by the respondents.

4.4 Changes in Occupational Structure

Table 25 shows anticipated trends in firms' occupational structure from 1981 to 1995. The following trends in occupational group shares may be discearned:

- Managerial and Materials Handling positions should decline as a share of the total.

- Machining and Fabricating occupations are projected to become a larger share of total employment.

- Natural Sciences, Processing and All Other positions should maintain a fairly stable share of the total.

The table shows that the gains in Machining's share will likely be concentrated in filing and grinding and all other machining

and that after 1985 the share of Machining occupations should be fairly stable. The trends illustrated for Machining in the table simplify complicated movements. Several respondents anticipate a significant decline in most Machining occupations. However, other firms, which anticipate fairly rapid employment growth, have a large percentage of Machining employees, helping to boost the share of Machining positions in total employment.

The modest increase in the Natural Sciences share is anticipated to be led by engineering technicians and systems analysts. In the Fabricating occupational group, fabricating and assembling positions should increase steadily as a share of total employment while mechanics and repairmen should gain share as well after the decline in share in 1985.

Results of Question 12

TABLE 25: HARDWARE, TOOL AND CUTLERY INDUSTRY SIC 306

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	20	17	16	14	13
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	6	5	5	6	6
• Engineers		-	0	-	0
• Engineering Technicians and Technologists		-	0	+	+
• Systems Analysts and Computer Programmers		-	+	+	0
• All Other Science and Mathematics (not listed above)		0	0	0	0
PROCESSING	2	2	2	3	3
MACHINING	46	51	54	53	54
• Tool and Die Making		0	-	0	0
• Machinist and Machine Tool Setting-Up		-	+	0	0
• Machine-Tool Operators		0	+	0	+
• Metal Shaping and Forming		0	0	0	0
• Filing, Grinding, Buffing, Cleaning and Polishing		+	+	0	0
• All Other Machining (not listed above)		+	0	-	0
FABRICATING, ASSEMBLING AND REPAIRING	11	10	10	11	12
• Fabricating and Assembling Metal Products		+	+	+	+
• Industrial Machinery Mechanics and Repairmen		-	0	+	+
• All Other Fabricating, Assembling and Repairing (not listed above)		+	0	0	0
MATERIALS HANDLING AND RELATED	6	6	5	5	4
ALL OTHER OCCUPATIONS	9	9	8	8	8
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

Results of Question 6

TABLE 26: HARDWARE, TOOL AND CUTLERY INDUSTRY

SIC 306

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	19	31	50
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	16	46	39
• Engineering Technicians and Technologists	19	58	23
• Systems Analysts and Computer Programmers	7	89	4
PROCESSING	8	32	60
MACHINING			
• Tool and Die Making	16	65	19
• Machinist and Machine Tool Setting-Up	31	39	30
• Machine-Tool Operators	39	39	22
• Metal Shaping and Forming	47	19	34
• Filing, Grinding, Buffing, Cleaning and Polishing	42	19	39
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	8	0	92
• Industrial Machinery Mechanics and Repairmen	0	65	35
MATERIALS HANDLING AND RELATED	39	15	46
OTHER	0	15	85

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job intent.

5.1 Effects on Occupations

Respondents were asked to indicate for each occupation whether they expected to experience shortage or oversupply in the next ten years.

On balance, firms expect shortages to occur in Managerial, Natural Sciences and Processing occupations as well as in tool and die making and industrial machinery repair. Respondents' views were qualified with respect to Managerial and Processing work, since 50 percent or more of respondents have no opinion.

Oversupply is expected by firms in Materials Handling and two Machining occupations, metal shaping and filing and grinding. Respondents' views are reported in Table 26.

5.2 Likely Steps To Deal With Skills Oversupply

Firms will use a variety of mechanisms if oversupply of skills becomes a problem. Layoffs are projected to be the major step in correcting oversupply in managerial and natural sciences positions. In other areas early retirement and retraining are expected to be primary steps taken to reduce excess skills availability. Attrition, layoffs, shorten hours and upgrading of workers' skills will be used selectively Table 27 records respondents' views.

Results of Question 7

TABLE 27: HARDWARE, TOOL AND CUTLERY INDUSTRY

SIC 306

Steps Firms Will Likely Take to Deal With an OVERSUPPLY of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Layoff	(1)	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Layoff	(1)	(1)
• Engineering Technicians and Technologists	Layoff	Shorter Hours	(2)
• Systems Analysts and Computer Programmers	Attrition	Shorter Hours	(2)
PROCESSING	Attrition	Shorter Hours	(2)
MACHINING			
• Tool and Die Making	Retrain	Upgrade	(2)
• Machinist and Machine Tool Setting-Up	Early Retirement	Retrain	Layoff
• Machine-Tool Operators	Early Retirement	Retrain	Upgrade
• Metal Shaping and Forming	Retrain	Upgrade	(2)
• Filing, Grinding, Buffing, Cleaning and Polishing	Early Retirement	Retrain	Layoffs
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	Layoff	Shorter Hours	Attrition
• Industrial Machinery Mechanics and Repairmen			
MATERIALS HANDLING AND RELATED	Retrain	Attrition	Shorter Hours

(1) Only one step mentioned.
(2) Only two steps mentioned.

5.3 Likely Steps To Deal With Skills Shortages

Firms are recruiting and retraining as their preferred methods of eliminating or reducing skills shortages. Both are mentioned in connection with occupations requiring a high level of formal education. However, the use of overtime replaces retraining as one of the two most important steps to deal with shortages in other occupations. Upgrading and contracting work out are also considered potentially useful in certain occupations. Table 28 presents respondents' views.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on selected occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

In most cases respondents expect that the introduction of new technology will increase skill requirements. These views are less strongly held with respect to Machining tasks than Managerial, Natural Sciences or Processing. Industrial machinery mechanics are expected to require skills upgrading but this should not be necessary for fabricating and assembling tasks. No change in skills requirements is expected for those in filing and grinding and Materials Handling.

One aspect of new technology's effect on skill requirements is the increasing applicability of training for one position to the skills required for related positions. While this development may not affect skill requirement levels directly, it may affect training time and costs in future by making a firm's work force more flexible than previously.

In contrast to the effect of technological change on skill

Results of Question 8

TABLE 28: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Steps Firms Will Likely Take to Deal With a SHORTAGE of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Upgrade	Recruit	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Recruit	Retrain	(1)
• Engineering Technicians and Technologists	Recruit	Retrain	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Retrain	Overtime
PROCESSING	Retrain	Overtime	Contract out
MACHINING			
• Tool and Die Making	Retrain	Overtime	Upgrade
• Machinist and Machine Tool Setting-Up	Retrain	Overtime	Recruit
• Machine-Tool Operators	Retrain	Overtime	Upgrade
• Metal Shaping and Forming	Overtime	Retrain	Recruit
• Filing, Grinding, Buffing, Cleaning and Polishing	Overtime	Retrain	Recruit
FABRICATING, ASSEMBLING AND REPAIRING			
• Industrial Machinery Mechanics and Repairmen	Retrain	Recruit	Overtime
MATERIALS HANDLING AND RELATED	Upgrade	(2)	(2)
OTHER	Recruit	Retrain	(1)

(1) Only two steps mentioned.
(2) Only one step mentioned.

Results of Question 9

TABLE 29: HARDWARE, TOOL AND CUTLERY INDUSTRY — SIC 306

Impact of Technology on Skill Levels and Job Content

(1) Percent of Firms

Occupations	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	100	0	0	11	70	19	85	0	15
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	90	0	10	0	41	59	59	0	41
• Engineering Technicians and Technologists	95	0	5	28	32	40	80	0	20
• Systems Analysts and Computer Programmers	68	5	27	19	39	42	58	0	42
PROCESSING	84	8	8	6	25	69	76	0	24
MACHINING									
• Tool and Die Making	55	18	27	19	23	58	44	0	56
• Machinist and Machine Tool Setting-Up	57	38	5	4	56	40	44	32	24
• Machine-Tool Operators	64	4	32	15	27	58	54	4	42
• Metal Shaping and Forming	57	0	43	0	22	78	42	0	58
• Filing, Grinding, Buffing Cleaning and Polishing	19	24	57	16	20	64	18	19	63
FABRICATING, ASSEMBLING AND REPAIRING									
• Fabricating and Assembling Metal Products	25	25	50	0	12	88	0	0	100
• Industrial Machinery Mechanics and Repairmen	95	0	5	50	32	18	56	0	44
MATERIALS HANDLING AND RELATED	0	6	94	0	5	95	0	0	100

\+ increase - decrease 0 remain the same

(1) Non-responses excluded.

requirements, the time required to achieve proficiency is expected to decline for most occupations. However, respondents expecting no change are frequently in the majority. The most likely candidates for decreases in time requirements are Managerial occupations and machinists. Industrial machinery mechanics and repairmen are the only members whose time to achieve proficiency is expected to lengthen.

Trends in knowledge requirements regarding the firm's operations are expected to be similar to those in skills requirements. Respondents are less convinced about knowledge increases being necessary for those in Machining tasks than for those in Managerial, Natural Sciences and Processing. Respondents' views are summarized in Table 29.

5.6 Training Costs and New Technology

Training costs are a significant proportion of total labour costs, approximately 5 percent at present. A modest increase to about 6.5 percent is expected by 1995. Small firms currently spend slightly above the industry average share and expect this share to increase. In contrast, medium sized firms spend somewhat less than small firms, about 2.5 to 3.0 percent of total labour costs.

Training expenditures to handle technology have traditionally been small percentages of total training costs. However, the industry average is currently estimated to be about 50 percent and is expected to remain at this level to 1995. Again, small firms anticipate spending a slightly higher percentage of training costs on training related to new technology than do medium sized firms.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

In 1982, in the Hardware, Tool and Cutlery Industry in Ontario, 4,205 employees or 33 percent of the 12,826 employees were unionized. The two major unions in the industry are the United Auto Workers and the Steelworkers representing 28 and 30 percent of the unionized workers respectively. In addition to those detailed on Table 30, the workers are represented by the following unions:

- Machinists
- Molders
- Communications & Electronics
- United Electrical Workers
- Christian Labour Association
- Labourers
- Woodworkers
- Sheet Metal Workers
- Teamsters

The major employers with union agreements are shown in Table 30. There are only three with settlements involving more than 200 employees - A.G. Simpson Co., Cooper Tool Group and Pionneer Chain Saw. The other 53 firms with agreements employ the remaining 3,000 employees.

6.2 Trends in Unionization

Union representation occurs in an estimated 83 percent of medium sized firms but in no small firms, according to respondents. In medium sized firms with a union, an estimated 64 percent of the work force was unionized in 1984. This percentage is expected to decline slightly to about 61 percent by 1995.

TABLE 30

INDUSTRIAL RELATIONS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

UNION	NUMBER OF MEMBERS	MAJOR EMPLOYER*	LOCATION	TECHNOLOGICAL CHANGE CLAUSES
UNITED AUTO WORKERS	154	H.E. Vannatter Ltd.	Wallaceburg	NA
	111	Paragon Tools Co.	Windsor	NA
	104	Proto Canada (Division of Ingersoll Rand Canada)	London	NA
UNITED STEELWORKERS	320	Cooper Tool Group	Port Hope	None
	120	Cooper Tool Group	Barrie	NA
	230	Pioneer Chain Saw	Peterborough	None
	150	Waterloo Metal Stampings	Kitchener	NA
	111	Snap-On Tools of Canada	Concord	NA
INDEPENDENT LOCAL	650	A.G. Simpson Co.	Scarborough & Oshawa	None
MOLDERS	170	Emhart Canada International Hardware Division	Belleville	NA
COMMUNICATIONS & ELECTRONICS	169	Gray Forgings & Stampings	Brampton	NA
CLC DIRECTLY CHARTERED	152	International Tools Division of International Tools 1973	Windsor	NA

* Employer with a union agreement covering 100 employees or more. The union agreements above represent 58 percent of unionized employees.

NA Data not available from Ontario Ministry of Labour's Data base for firms with less than 100 employees.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

6.3 Technology Change Clauses

Technology change clauses have just been introduced in the industry's collective bargaining agreements. The only such clause reported by the survey had not yet been applied to a workplace problem. Details of the clause include a guarantee of notice of technological change and an agreement to give workers a chance to upgrade their skills in the event of an innovation being introduced.

6.4 Management's Perception of their Union's Position on New Technology

Management respondents view unions as being divided about accepting new technology. Some union leaders accept the need for change without reservation but they still have several concerns about the process of technological change. The most important concern is job security for members who might be displaced by innovation. Some respondents report that while the union membership accepts the need for technological change, their leadership does not but this attitude is not widespread.

The union perspective on their own attitudes confirms this somewhat divided picture. Several describe themselves as being either accepting of, or wholeheartedly in favour of technological change. This may include wanting to push a management into change in order to preserve jobs by remaining competitive. The problem sometimes lies in what unions feel are the ill-defined objectives of management in planning change. Other concerns include getting a technology change clause into the contract to formalize the process of change and the workers role in it.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets,

improving productivity and/or quality and adopting new technology.

Formal mechanisms exist in production and sales decisions at all levels of operation in small firms but not at upper levels in medium sized firms. Formal participation rates rise as the scale of decision making declines, with 31 percent of firms involved at the company and division level and 70 percent at the working group level.

Productivity and quality decisions incorporate workers' opinions formally in about 89 percent of firms, with the rate for small firms again higher than for medium sized firms. New technology decisions are dealt with by about 50 percent of firms. Again, a higher proportion of small firms than medium sized firms have set up a formal mechanism in this area.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked to what extent management should involve workers in decisions regarding the adoption of new technology.

Among executives a full range of views may be found. Some feel that full involvement is essential in all stages of adoption. These respondents feel that worker input is essential in deciding which new technology to acquire and in incorporating it rapidly and efficiently into plant or office operations. Others say the exact opposite, asserting that it is clear what new technology needs to be adopted.

The bulk of management opinion lies in between these positions. Respondents stress the importance of keeping employees informed about changes - especially in the period before a new technology is acquired - in order to get workers' views on specific needs

that new technology might answer. Another important element for these executives is to make sure that technology's effect on job security is understood. Most respondents prefer an informal process for technology adoption decisions. Others are willing to see a formal structure setup especially when dealing with union representatives.

Union opinion leans towards advocating full involvement in the process of technological change. This view is based in part on the desire to keep productivity increasing, maintaining job security by ensuring that the firm is well positioned to attract new orders. Another concern is that involvement by workers should be early enough to give them time to train for new positions and equipment.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of these results appears in Table 31.

An estimated 50 percent of the industry makes use of strategic planning in determining future production directions. Medium sized firms are more likely to make use of strategic planning than are small firms.

Human resource planning occurs in a similar 50 percent of the industry. However, in this case, size of firm appears not to matter. Size of firm is a factor in capital investment planning, being used by 60 percent of small firms and 83 percent of medium sized firms.

For both types of planning, respondents indicate that they have a planning horizon of about four years, with small firms looking slightly further into the future than the medium sized firms.

Even though a smaller proportion of small firms engage in capital investment planning than do medium sized firms, small firms perceive a relatively higher level of integration between capital investment and human resource plans.

Results of Question 18

TABLE 31: HARDWARE, TOOL AND CUTLERY INDUSTRY

SIC 306

Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Small (20-99)	40	50	4	60	4	4.0
Medium (100-499)	83	50	3	83	3	3.3
Total Firms	50	50	4	65	4	
						3.8

1. Using a scale of 1 to 5; 1 repesents "Not at all integrated" and 5 "Highly integrated".

SECTION III MISCELLANEOUS METAL FABRICATING INDUSTRIES

PART II HISTORICAL TRENDS 1971 - 1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of Miscellaneous Metal Fabricating Industry trends for the period 1971 to 1981 and 1982 to 1984. In 1982, the Miscellaneous Metal Fabricating Industry in Ontario included 340 establishments with $1.0 billion of manufacturing shipments. Also in 1982, SIC 309 accounted for 29 percent of the total manufacturing shipments of SIC's 304, 306 and 309 combined. As such, the Miscellaneous Metal Fabricating Industry is the second largest of the three metal fabricating operations under consideration in this report.

The Miscellaneous Metal Fabricating Industry includes establishments such as Wabco-Standard Inc., Advanced Extrusions Limited and Canvil Ltd. These and the other manufacturers included in this industry are primarily engaged in manufacturing metal products not elsewhere classified, such as weather stripping, guns, collapsible tubes, machinery fittings, plumbers' goods (including enamelled plumbing fixtures), safes and vaults, forgings such as chains (except tire chains), anchors and axles. Also included are establishments primarily engaged in fabricating bars and rods for reinforcing concrete.

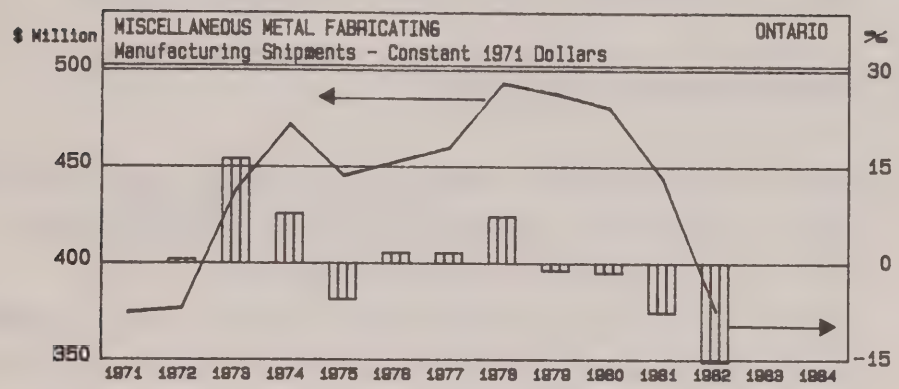
Table D16 lists the major products of SIC 309 in order of importance. Valves and parts and forgings and castings are the largest product categories of SIC 309, representing respectively 14.6 percent and 13.6 percent of the value of shipments by the industry in 1981. Other products not listed in Table D16 accounted for over 31 percent of the value of shipments by miscellaneous metal fabricators in 1981, indicating that this industry manufactures a wide variety of product items.

2.1 Industry Trends

Tables D17 to D20 present key industry indicators for the years 1971 to 1984.

2.1.1 Aggregate Output

EXHIBIT 15



Manufacturing shipments of the Miscellaneous Metal Fabricating Industry increased from $374.2 million in 1971 to $1,134.8 million in 1981. In constant 1971 dollars, manufacturing shipments increased from $374.2 million to $443.3 million over the 1971 to 1981 period averaging an annual rate of real growth of 1.7 percent.

The rate of growth of constant dollar shipments of SIC 309 fluctuated considerably over the 1970's with large increases recorded in the early 1970's followed by a decline in 1975. Thereafter, constant dollar manufacturing shipments increased gradually to peak in 1978 at $492.9 million before declining each year through 1982. The weak performance of manufacturing shipments over the period 1979 through 1982 is in part explained by a general decline in capital investment activity as several of the major energy mega projects were cancelled or postponed indefinitely in the early 1980's. As well, the 1981-1982 economic recession had a devastating effect on the Miscellaneous Metal Fabricating Industry as capital spending activity in all segments of the Canadian economy declined in the face

of soaring interest rates, high corporate debt loads and low capacity utilization rates in manufacturing.

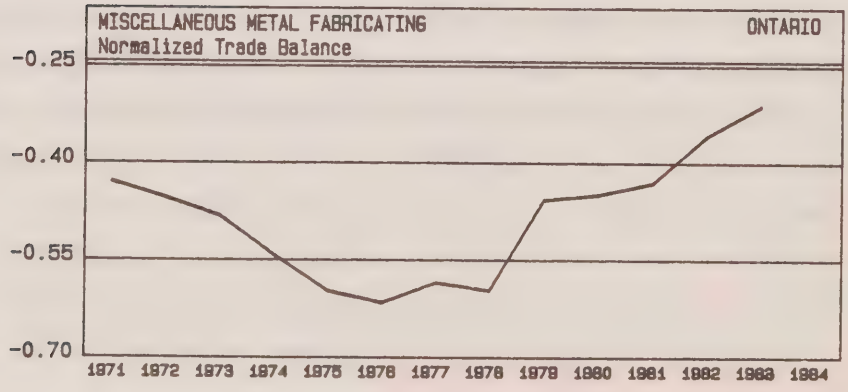
In current dollars, manufacturing shipments of SIC 309 declined 8.2 percent to $1,042.0 million in 1982 over the peak 1981 level of $1,134.8 million. In constant 1971 dollars, manufacturing shipments continued to record a fourth year of decline in 1982, falling 15.4 percent to $375.1 million over 1981 levels of $443.3 million.

2.1.2 Competitive Position

The value of Ontario's imports of miscellaneous fabricated metal products has exceeded the value of exports since 1971. On average, imports exceeded exports by a three-to-one ratio over the period 1971 to 1983; however, in 1976, the ratio reached a maximum of four-to-one while in 1983, the ratio reached a low of just under two-to-one.

Exhibit 16 below shows Ontario's normalized trade balance (exports minus imports divided by exports plus imports) for the Miscellaneous Metal Fabricating Industry. The chart shows that Ontario's negative trade balance as a percent of total trade became increasingly larger in the period from 1971 through 1976. By contrast, from 1976 through 1983, Ontario's normalized trade balance became increasingly more positive.

EXHIBIT 16



As with the other two segments of the Miscellaneous Metal Fabricating Industry, value added per dollar of labour data for miscellaneous metal fabricating is only available for Ontario and not for the United States. In the United States, data is available for SIC's 304, 306 and 309 combined. Thus Exhibit 17 below shows value added per dollar of labour data for SIC 309 in Ontario relative to SIC's 304, 306 and 309 combined in Ontario and in the United States.

EXHIBIT 17

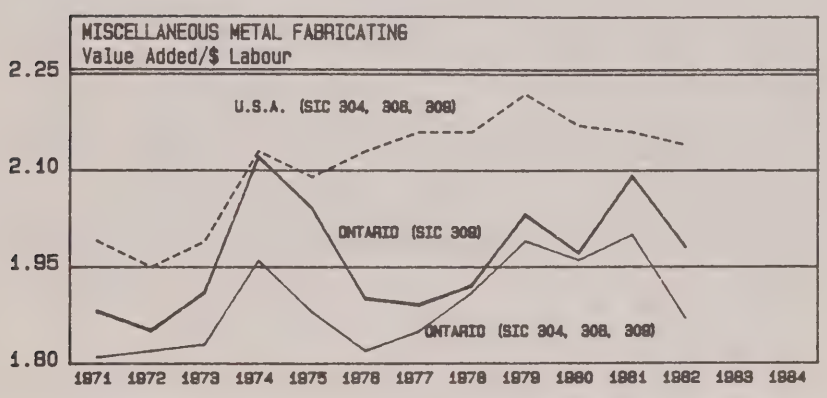


Exhibit 17 illustrates that value added per dollar of labour was consistently higher for the three SIC's combined in the United States than for SIC 309 or the three SIC's combined in Ontario over the period 1971 to 1982. As well, value added per dollar of labour in Ontario was higher for SIC 309 than for SIC's 304, 306 and 309 combined over the decade.

Value added per dollar of labour for SIC 309 in Ontario reached a peak in 1974 and then fluctuated at lower levels through the balance of the decade. In the United States, value added per dollar of 306 labour continued to rise gradually through 1979 for SIC's 304, 306 and 309 combined before falling off somewhat in the early 1980's.

2.1.3 Capital Investment

As with SIC's 304 and 306, capital investment statistics are only available for Canada as a whole for SIC 309. However, in 1982, Ontario based manufacturers in the Miscellaneous Metal Fabricating Industry accounted for 73.8 percent of total Canadian shipments of these products.

Total capital spending by the Miscellaneous Metal Fabricating Industry increased from $15.4 million to $56.1 million in current dollars from 1971 to 1981. In constant 1971 dollars, capital spending increased from $15.4 million in 1971 to $23.1 million in 1981, averaging an annual rate of real growth of 4.1 percent.

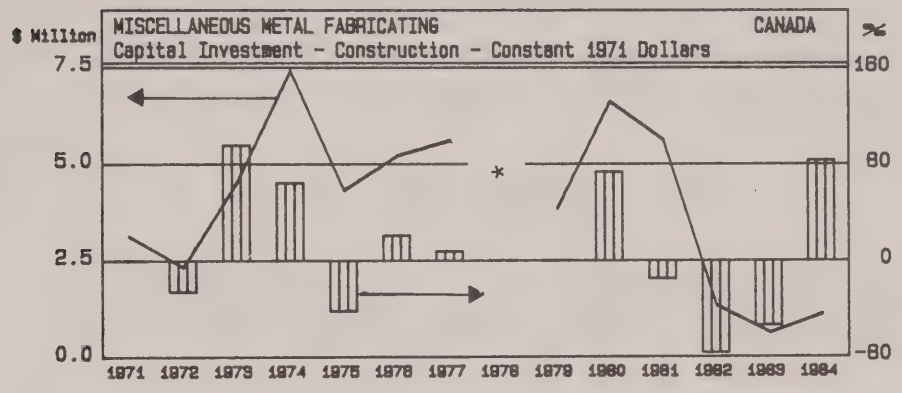
In the period from 1982 to 1984, total capital spending in current dollars fell from $56.1 million in 1981 to $32.6 million in 1982 and then continued to decline through 1983. In 1984, current dollar capital spending is expected to increase by 38.1 percent to $27.9 million.

In constant 1971 dollars, real capital spending declined by 46.3 percent in 1982 over 1981 levels and then recorded another decline of 40.3 percent in 1983 over 1982 levels. In 1984, constant dollar capital spending is expected to increase by 32.4 percent to $9.8 million compared to total constant dollar capital spending of $12.4 million in 1982 and $23.1 million in 1981.

Looking at the 1971 to 1984 period as a whole, total capital spending in constant 1971 dollars by the Miscellaneous Metal Fabricating Industry fluctuated in the 15 to 28 million dollar range, reaching a peak of $27.8 million in 1980. Thereafter, total capital spending declined dramatically to new lows for the decade in 1983.

The 1984 revised intentions survey indicates that total capital spending in SIC 309 is expected to increase by 32.4 percent in constant 1971 dollars in 1984. This is made up of an expected 27.9 percent increase in the value of machinery and equipment spending and an 83.3 percent increase in the value of construction spending.

EXHIBIT 18



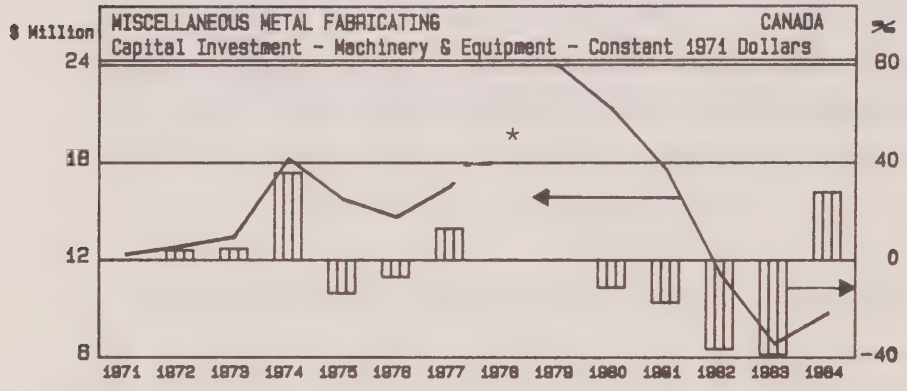
* 1978 data is secured (see Tables D.17 to 20)

Spending on construction was significantly less than spending on machinery and equipment by SIC 309 over the 1971 to 1981 period. Machinery and equipment spending increased from $12.3 million in 1971 to $42.3 million in 1981 while the corresponding current dollar figures for construction spending were $3.1 million in 1971 and $13.8 million in 1981.

From 1982 to 1984, construction spending remained in the $1.8 to $3.5 million range while machinery and equipment spending fluctuated from a low of $18.4 million in 1983 to $29.1 million in 1982.

In constant 1971 dollars, machinery and equipment spending increased less rapidly over the 1971 to 1981 period - averaging an annual rate of increase of 3.6 percent from $12.3 million in 1971 to $17.5 million in 1981 - than construction spending which averaged an annual rate of increase of 6.1 percent from $3.1 million in 1971 to $5.6 million in 1982. During the period from 1982 to 1984, machinery and equipment spending averaged sharper declines of 11.5 percent (from $11.1 million in 1982 to $8.7 million in 1984) than construction spending which declined at an average annual rate of 8.0 percent (from $1.3 million in 1982 to $1.1 million in 1984).

EXHIBIT 19



* 1978 data is secured (see Tables D.17 to D.20)

As with the other segments of the metal fabricating industry, the reasons for the declines in capital spending for SIC 309 in the early 1980's included generally weak markets and low capacity utilization rates because of the cancellation and postponement of several energy mega projects in Western Canada. Plans for these projects had prompted a period of expansion by the metal fabricating industry in the late 1970's in anticipation of an increased demand for fabricated metal products. When the projects did not materialize, the industry was left with excess

capacity and high debt loads. At the same time, the 1981-1982 recession further depressed traditional markets for fabricated metal products both at home and in export markets.

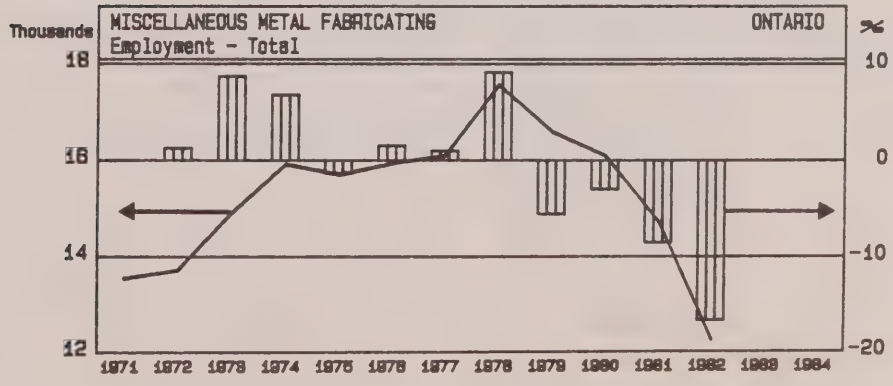
2.1.4 Employment

The discussion of employment for the Miscellaneous Metal Fabricating Industry includes an analysis of aggregate trends and occupational change.

- Aggregate Trends

In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the Census of manufacturing industries conducted by Statistics Canada annually. This data series is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

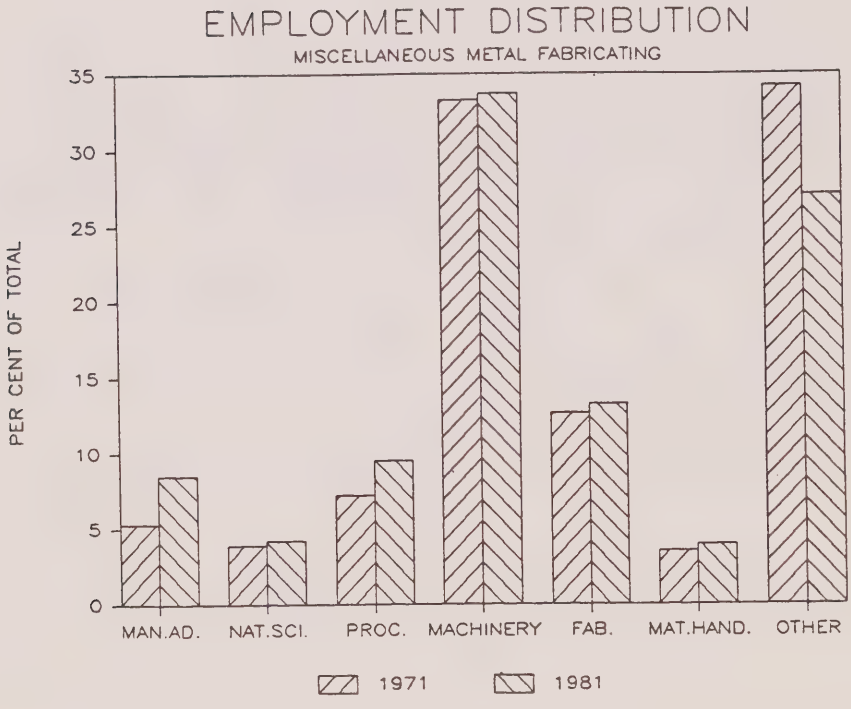
EXHIBIT 20



Total employment for the Miscellaneous Metal Fabricating Industry in Ontario increased from 13,532 employees in 1971 to 14,693 employees in 1981. Employment reached a peak for the decade in 1979 at 16,567 employees. The average annual growth in employment over the 1971 to 1981 period was 0.8 percent. In 1982, employment declined by 16.7 percent to 12,235 employees.

- Occupational Changes

EXHIBIT 21



Census data for Ontario show that total employment in the Miscellaneous Metal Fabricating Industry increased at an average annual rate of 3.3 percent over the 1971 to 1981 period. Six of the seven major occupational groups shown in Exhibit 21 increased in importance over the decade. Only the All Other group experienced a decrease in importance - from 34.2 percent of total employment in 1971 to 27.0 percent in 1981.

Analysis at the broad occupational level in Table D.21 indicates that the Managerial, Administrative and Related category experienced the most rapid average annual growth of 8.3 percent from 1971 to 1981. This category, however, continued to represent a relatively small proportion of total employment in SIC 309 - 8.5 percent - in 1981. By contrast, the Machining and Related occupational group, which accounted for 5,705 jobs and 33.7 percent of total employment, experienced the slowest average annual increases of 3.4 percent of any major occupational group from 1971 to 1981. Similarly, the Product Fabricating, Assembling and Repairing group which accounted for 2,235 jobs and 13.2 percent of total employment experienced relatively modest average annual increases of 3.7 percent from 1971 to 1981.

Analysis at the more detailed occupational level indicates that the fastest growing occupational category was production management which experienced average annual increases of 22.5 percent from 1971 to 1981. Nonetheless, production management only accounted for 2.5 percent of total employment in SIC 309 in 1981. Several occupational categories experienced declines in employment over the decade. The most rapid average annual declines were experienced by the moulding, coremaking and metal casting group followed by the machine-tool operating, metal machining foremen, metal processing and related foremen occupations. None of these occupational groups, with the exception of machine-tool operating, accounted for more than slightly over 1.0 percent of total employment in 1981.

Machine-tool operating accounted for 705 jobs or 4.2 percent of total employment in 1981.

The largest employment category in SIC 309, welding and flame cutting, accounted for 1,250 jobs and 7.4 percent of total industry employment in 1981. This occupational category experienced average annual rates of increase of 7.4 percent from 1971 to 1981 - well above the industry average of 3.3 percent.

Analysis by sex in Table D.22 indicates that female employment as a percent of total employment declined from 19.6 percent in 1971 to 19.3 percent in 1981 in the Miscellaneous Metal Fabricating Industry. From 1971 to 1981, 865 additional jobs were gained by females in the industry and in 1981, 3,270 females were employed in SIC 309.

All the major occupational groups experienced declines in female employment as a percent of total employment with the exception of Natural Sciences, Engineering and Mathematics and Product Fabricating, Assembling and Repairing. Despite increases in female representation in the Natural Sciences, Engineering and Mathematics group from 1971 to 1981, female employment as a percent of total employment was only 7.0 percent in 1981 - the lowest amongst the major occupational groups. By contrast, an increase in female representation in the Product Fabricating, Assembling and Repairing group caused female employment as a percent of total employment to be the highest of any two digit group at 28.9 percent in 1981. The Product Fabricating, Assembling and Repairing group also gained more jobs for women - 205 - than any other occupational group from 1971 to 1981.

At the more detailed occupational level, the most new jobs - 80 jobs - were gained for women in the other fabricating and assembling of metal products occupational group. Female employment as a percent of total employment in this group was amongst the highest in the industry in 1981 at 38.8 percent (down from 44.4 percent in 1971); and this occupational group accounted for a large number of jobs - 260 jobs or 8.0 percent of female employment in SIC 309.

Female employment as a percent of total employment was highest in the packaging, not elsewhere classified occupation in 1981 - 62.8 percent of total employment; however, this was only a moderately large occupational group, accounting for 135 jobs or 4.1 percent of female employment in 1981. No females were employed in the hoisting, not elsewhere classified, material-handling equipment operators, not elsewhere classified, metal processing and related foremen, tool- and die-making and industrial, farm and construction machinery mechanics and repairmen occupations in 1981.

Results of Question 3

TABLE 32: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985				1985-1990				1990-1995			
	Small	Medium	Large	Total	Small	Medium	Large	Total	Small	Medium	Large	Total
1. DESIGN TECHNOLOGIES												
Computer-Aided Design (CAD)	50	33	50	44	50	33	50	44	-	33	-	11
Computer-Aided Engineering (CAE)	0	0	0	0	50	100	100	68	-	-	-	-
CAD/CAM Integration	0	50	50	14	50	50	100	51	-	-	-	-
2. MANUFACTURING PLANNING AND CONTROL SYSTEMS												
Computerized Financial Systems	50	100	100	66	50	-	-	35	-	-	-	-
Computerized Order Entry/Inventory Control	25	100	100	48	75	40	-	64	-	-	-	-
Computer-Aided Process Planning	0	75	0	19	75	25	100	62	25	-	-	18
Manufacturing Resource Planning Systems (MRP)	33	50	0	38	67	50	100	62	33	-	-	23
Automated Shop Floor Data Collection	0	20	0	6	75	60	100	71	25	20	-	23
Computerized Decision Support Systems	0	75	0	31	50	50	100	50	50	-	-	29
Computerized Maintenance Planning and Control	0	0	50	1	-	80	50	51	100	20	-	48
3. MANUFACTURING PROCESS TECHNOLOGIES												
Numerically Controlled Machines (NC)	50	67	100	57	-	33	100	13	-	-	-	-
Computer Controlled CN Machines (CNC)	50	50	50	50	-	75	100	32	-	-	50	1
CAD Directed CNC	0	0	0	0	50	-	100	44	-	100	50	16
Computerized Process Control Systems	50	33	0	44	-	67	100	24	-	-	-	-
Computer-Aided Inspection and Testing	0	0	100	1	50	100	-	70	-	-	-	-
Robotic Applications	0	60	100	29	50	40	100	46	-	60	50	28
Flexible Manufacturing Technologies	0	0	0	0	-	100	100	29	-	-	50	2
Computer Integrated Manufacturing (CIM)	0	0	0	0	-	-	100	2	-	-	-	-
4. MATERIALS HANDLING TECHNOLOGIES												
Automatic Bulk Handlers/Feeder Systems	0	100	0	26	100	-	-	74	-	-	-	-
Automated Conveyor/Vehicle Systems	0	50	0	20	-	75	100	31	50	-	-	29
Automated Storage and Retrieval	0	0	0	0	-	-	100	2	50	-	-	29
Computer Controlled Conveyor/Vehicles	0	0	0	0	-	100	100	27	-	-	-	-
Automated Warehouse	0	0	0	0	-	-	-	-	-	-	100	2
Other	0	0	0	0	50	-	-	35	-	-	-	-
5. TELECOMMUNICATIONS TECHNOLOGIES												
Facsimile (FAX) Link: HO/Plant(s)	50	50	100	51	-	50	-	13	-	-	-	-
Computer Link: HO/Plant(s)	0	67	100	35	-	33	-	17	-	-	-	-
Computer Link: Suppliers/Customers	0	0	0	0	100	100	100	100	-	-	-	-

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for periods 1985-1990 and 1990-1995 to indicate respondents, at the time of the survey, are not planning to adopt this technology or 'don't know'. Responses are not mutally exclusive.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this study presents the survey results which discuss surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Miscellaneous Metal Fabricating Industry and the factors driving the need for and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The industry has already adopted several new technologies in most stages of the production process, the sole exception being materials handling. Significant purchasing is planned for the 1985-1990 period not only in technology already in wide use but in many others not yet investigated. The details are presented in Table 32 and discussed below.

3.1.1 Design Technologies

Computer assisted design (CAD) is in use by an estimated 44 percent of the industry and has been integrated with computer assisted manufacturing (CAM) in 50 percent of the large and medium sized firms. Firms of all sizes plan to extend their use of these techniques in the 1985-1990 period as well as make purchases for computer aided engineering (CAE) tasks.

3.1.2 Manufacturing Planning and Control Technologies

Medium sized firms have led the way in adopting a broad range of planning and control technologies. Other firms have accompanied them in applying computers to financial

analysis and order entry. A majority of the industry plans to purchase systems in all areas except computerized financial systems in the 1985-1990 period. Small firms expect to lag the larger firms somewhat to 1990 but intend to adopt new technologies in such areas as manufacturing resource planning, computerized decision support and computerized maintenance planning between 1990 and 1995.

3.1.3 Manufacturing Process Technologies

The focus of interest to date in this area has been numerically controlled (NC) machines and their computerized brethren (CNC), having been adopted by at least 50 percent of the industry. Large firms lead others in penetration rates for new technologies and plan a steady program of purchases to 1995 in several areas. Other firms identify such areas as computer aided inspection and testing and links between CAD systems and computerized numerically controlled machines for expenditure in the late 1980's. Robotics will build on the 29 percent penetration rate as of 1985 with investment expenditures by firms of all sizes to 1990 and by a majority of large and medium sized firms thereafter. Small firms appear to be willing to consider adopting a slightly narrower range of new technology than larger firms.

3.1.4 Materials Handling Technologies

Very little new technology in this area has been absorbed by the industry. Moderate purchasing is planned for the 1985 to 1990 period. Small firms will likely concentrate on automatic bulk handlers, while others will introduce automated conveyors, storage and retrieval as well as computer controlled conveyors. Firms are indefinite about their plans past 1990 although small firms may follow the others into automated conveyors and storage and retrieval.

3.1.5 Telecommunications Technologies

The first half of the 1980's has seen firms link their plants and head offices with facsimile (FAX) and computer systems. More work in this area is yet to come for medium sized firms. However, the second half of the 1980's will see the entire industry begin to link its operations by computers forward to customers and backward to suppliers.

3.2 Forces Driving the Need to Adopt New Technology

Two forces are behind the impetus to acquire new technology.

These are:

- the need to lower costs, and
- the pressures of competition.

These views are shared by firms of all sizes. Respondents identify cost reduction vis-a-vis their competitors, both foreign and domestic, as their top priority. A secondary source of competitive pressure, especially for medium sized firms, lies in customers' interest in quality improvement. Other concerns related to the two listed above include the desire to increase profitability and productivity. Respondents views are presented in Table 33.

3.3 Factors that Could Slow the Rate of Technology Adoption

The industry reports that it may be restricted in acquiring new technology by the following factors:

- poor economic conditions,
- the competitiveness of the environment, and
- the ability to finance purchases.

Results of Question 4

TABLE 33: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Most Important Factors Driving the Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
COMPETITIVE PRESSURES	First	25	40	50	30
	Second	0	20	0	6
	Third	25	20	50	24
	Weighted Importance (1)	1.0	1.8	2.0	1.3
STRATEGIC	First	0	0	0	0
	Second	25	0	0	17
	Third	0	0	0	0
	Weighted Importance	0.5	0.0	0.0	0.3
CUSTOMER DEMANDS FOR CHANGES	First	0	40	0	12
	Second	25	0	0	17
	Third	0	0	0	0
	Weighted Importance	0.5	1.2	0.0	0.7
INCREASE PROFITABILITY	First	25	0	0	17
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.8	0.0	0.0	0.5
INCREASE PRODUCTIVITY	First	25	0	0	17
	Second	0	0	50	1
	Third	0	20	0	6
	Weighted Importance	0.8	0.2	1.0	0.6
INCREASE QUALITY	First	0	0	0	0
	Second	0	20	0	6
	Third	0	20	50	7
	Weighted Importance	0.0	0.6	0.5	0.2
LOWER COSTS	First	25	20	50	24
	Second	50	20	50	41
	Third	25	0	0	17
	Weighted Importance	2.0	1.0	2.5	1.7
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0	40	0	12
	Second	0	20	0	23
	Third	25	40	100	65
	Weighted Importance	0.3	1.0	0.0	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 34: MISCELLANEOUS METAL FABRICATING INDUSTRY SIC 309

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
ABILITY TO FINANCE	First	25	20	0	23
	Second	25	20	50	24
	Third	0	20	50	7
	Weighted Importance (1)	1.3	1.2	1.5	1.2
COST OF NEW TECHNOLOGY	First	0	0	0	0
	Second	25	20	0	23
	Third	25	0	0	17
	Weighted Importance	0.8	0.4	0.0	0.6
COMPETITIVE ENVIRONMENT	First	50	0	0	35
	Second	0	20	0	6
	Third	0	0	0	0
	Weighted Importance	1.5	0.4	0.0	1.2
POOR ECONOMIC CONDITIONS	First	25	60	0	35
	Second	25	0	0	17
	Third	0	0	0	0
	Weighted Importance	1.3	1.8	0.0	1.4
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0	20	100	18
	Second	0	40	0	12
	Third	25	20	0	23
	Weighted Importance	0.3	1.6	2.5	0.7
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0	0	0	0
	Second	0	0	0	0
	Third	0	0	50	1
	Weighted Importance	0.0	0.0	0.5	0.0
UNWILLINGNESS TO CHANGE	First	0	0	0	0
	Second	0	0	0	1
	Third	0	0	50	0
	Weighted Importance	0.0	0.0	1.0	0.0
ALL OTHERS	First	0	0	0	0
	Second	25	0	0	17
	Third	0	0	0	0
	Weighted Importance	0.5	0.0	0.0	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

The experience of the early 1980's has apparently influenced respondents by making them very aware of the limitations placed on a firm's opportunities by lack of market growth and the inroads of foreign competition. Some respondents mention foreign competition as both an inducement for technological change and as a retarding influence as well.

Large firms differ from others in focusing upon problems in acquiring and implementing new technology. Not only is lack of skilled personnel a problem but management also sometimes finds it difficult to allocate time to study new technology options and costs.

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the industry in terms of aggregate output (i.e., manufacturing shipments in Ontario), investment, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

The industry expects its strong recovery in 1984 from the recession to continue in 1985, with real output increasing by about 5.5 percent over 1984 levels. The period 1985 to 1995 is expected to see growth in shipments of about 2 percent per annum. Views differ depending upon firm size. Small firms expect shipments to grow by 7.5 percent in 1985 and then by 2.5 per cent per annum thereafter. A summary of growth expectations appears in Table 35.

4.2 Investment Patterns

Firms plan to devote the bulk of their investment expenditures (about 80 percent) to machinery and equipment. New technology is expected to be related to approximately 50 percent of machinery and equipment investment during the next ten years. In contrast, structures investment is projected to have a new technology component in only about 23 percent of expenditures.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The use of a return on investment criterion is limited to about 18 percent of the industry. Firms using it appear to require a return of about 30 percent to justify the application of funds. The pay-back period criterion is in widespread

Results of Question 1

TABLE 35: MISCELLANEOUS METAL FABRICATING INDUSTRY SIC 309

Manufacturing Shipments in Ontario

Average Annual Compound Rate of Change (in Constant Dollars)

Firms by Employment Size	Estimated 1982-1983	Estimated 1983-1984	Estimated 1984-1985	Expected 1985-1990	Expected 1990-1995
Small (20-99)	-9.0	4.5	7.5	2.5	2.5
Medium (100-499)	2.5	5.5	2.5	0.5	1.0
Large (500+)	2.5	2.5	1.0	1.0	0.0
Total Firms	-4.5	5.0	5.5	2.0	2.0

(1) Rounded to closest 0.5%

Results of Question 17e

TABLE 36: MISCELLANEOUS METAL FABRICATING INDUSTRY — SIC 309

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period: % of Firms Using Pay-Back	Pay-Back Period: Average Period	Return on Investment: % of Firms Using ROI	Return on Investment: Average Rate
Small (20-99)	75	6 years	25	30.0
Medium (100-499)	100	2 years	0	-
Large (500+)	0	-	100	25.0
Total Firms	82	5 years	18	30.0

Answers are not mutually exclusive.

Results of Question 17f

TABLE 37: MISCELLANEOUS METAL FABRICATING INDUSTRY — SIC 309

Source of Funds for New Technology Spending

Firms by Employment Size	Internal Funds	External Funds
	Percent	Percent
Small (20-99)	38	62
Medium (100-499)	73	27
Large (500+)	100	0
Total Firms	49	51

Results of Question 11a,b,c

TABLE 38: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
INCREASE SALES/ INCREASE MARKET SHARE	First	25	20	0	23
	Second	25	0	0	17
	Third	0	20	0	6
	Weighted Importance (1)	1.3	0.8	0.0	1.1
INTRODUCTION OF NEW TECHNOLOGY	First	0	0	50	1
	Second	25	0	0	17
	Third	0	0	0	0
	Weighted Importance	0.5	0.0	1.5	0.3
SUCCESS IN FOREIGN MARKETS	First	0	0	0	0
	Second	0	0	0	6
	Third	0	20	0	0
	Weighted Importance	0.0	0.2	0.0	0.1
PRODUCT DIVERSIFICATION	First	0	0	0	0
	Second	0	40	0	12
	Third	25	0	0	17
	Weighted Importance	0.3	0.8	0.0	0.4
ABILITY TO COMPETE	First	25	0	50	18
	Second	50	20	0	41
	Third	0	0	0	0
	Weighted Importance	1.8	0.4	1.5	1.3
INDUSTRY-WIDE GROWTH	First	25	40	0	29
	Second	0	20	0	6
	Third	0	0	0	0
	Weighted Importance	0.8	1.6	0.0	1.0
OVERALL ECONOMIC GROWTH	First	25	20	0	23
	Second	0	20	0	6
	Third	0	0	50	1
	Weighted Importance	0.8	1.0	0.5	0.8
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	0	20	0	6
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.6	0.0	0.2
ALL OTHERS	First	0	0	0	0
	Second	0	0	50	1
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	1.0	0.0

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

use, by over 80 percent of the industry. The industry looks for investment to pay for itself within five years, although views vary widely from firm to firm. Respondents' views are recorded in Table 36.

4.2.2 Source of New Capital Spending

The industry expects to finance about 50 percent of its anticipated investment programs from internal funds and 50 percent from external funds. Plans vary widely across firms, with reliance on internal funds increasing on average with firm size. Survey details are presented in Table 37.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

Market conditions provide the most important influences upon firms' employment. Small firms focus on market share and firm sales considerations as well as their competitiveness versus their market rivals. Medium sized firms have a broader perspective, being primarily concerned with the overall growth rate of the economy and the industry and secondarily with their own firm's sales. Large firms are also concerned about the ability to compete but the rate at which they introduce new technology is likely to be equally important. Innovations will determine product quality, they say, and their ability to attract business, as well as having a potentially direct effect on employee requirements. A summary of respondents' views appears in Table 38.

Results of Question 11d

TABLE 39: MISCELLANEOUS METAL FABRICATING INDUSTRY — SIC 309

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	-4.5	13.0	1.0	1.0
Medium (100-499)	-3.5	-1.0	0.5	-1.0
Large (500+)	-0.5	1.0	-0.5	0.5
Total Firms	-3.5	4.5	0.5	0.0

(1) Rounded to closest 0.5%.

4.3.2 Employment Outlook

The industry expects strong employment growth to continue in 1985, offsetting declines in previous years. Although firms on average expect about 4.5 percent growth in 1985, views vary widely, from the 13 percent growth expected by small firms to a 1 percent decline by medium sized firms. The 1985 to 1995 period is expected to see a slowdown in employment (see Table 39).

A comparison with respondents' views on constant dollar shipments growth shows that shipments are expected to grow about 1 to 2 percent faster than employment. Based on these views, firms appear to expect modest increases in labour productivity over the next ten years.

4.3.3 Trends in Part-Time Work

Part-time work is a negligible share of industry employment, with no firm reporting having more than one percent of its work force on a part-time status. No change in this situation is expected to 1995.

4.4 Changes in Occupational Structure

Table 40 shows trends in firms' occupational structure to 1995. The following summarizes the principal trends.

- declines in share of total employment are expected for the following occupational groups:

  - Managerial,
  - Fabricating, and
  - Materials Handling.

Results of Question 12

TABLE 40: MISCELLANEOUS METAL FABRICATING INDUSTRY — SIC 309

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	18.9	19.3	18.9	18.2	17.8
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	3.6	3.7	3.7	5.0	5.1
• Engineers		0	0	0	0
• Engineering Technicians and Technologists		+	0	+	+
• Systems Analysts and Computer Programmers		0	0	+	+
• All Other Science and Mathematics (not listed above)		0	0	0	0
PROCESSING	13.5	13.0	12.4	13.7	13.9
MACHINING	18.7	17.4	18.7	19.1	20.2
• Tool and Die Making		0	+	+	+
• Machinist and Machine Tool Setting-Up		0	0	0	-
• Machine-Tool Operators		0	0	0	+
• Metal Shaping and Forming		0	+	+	+
• Filing, Grinding, Buffing, Cleaning and Polishing		-	0	0	-
• All Other Machining (not listed above)		-	0	0	0
FABRICATING, ASSEMBLING AND REPAIRING	32.8	33.3	33.8	31.4	30.3
• Fabricating and Assembling Metal Products		+	0	-	-
• Industrial Machinery Mechanics and Repairmen		+	+	+	0
• All Other Fabricating, Assembling and Repairing (not listed above)		0	-	-	-
MATERIALS HANDLING AND RELATED	7.2	7.5	7.1	6.3	6.1
ALL OTHER OCCUPATIONS	5.2	5.8	5.5	6.4	6.5
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

- increases in occupational shares are expected for:

  - Natural Sciences and Engineering,
  - Processing,
  - Machining, and
  - All Other occupations.

Table 40 shows which individual occupations expect to be the sources of major change in occupational shares. For example, the increase in the share of Science and Engineering is expected to occur mostly among engineering technicians and technologists and systems analysts. In Machining, the strong occupations are expected to be tool and die making and metal shaping and forming. Fabricating should see declines in some occupations, namely fabricating and assembling metal products and the all other fabricating category, but increases in the share of mechanics and repairmen.

Results of Question 6

TABLE 41: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	7	41	53
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	0	36	64
• Engineering Technicians and Technologists	0	60	40
• Systems Analysts and Computer Programmers	17	13	70
PROCESSING	7	0	93
MACHINING			
• Tool and Die Making	1	36	63
• Machinist and Machine Tool Setting-Up	1	24	75
• Machine-Tool Operators	24	23	53
• Metal Shaping and Forming	7	47	46
• Filing, Grinding, Buffing, Cleaning and Polishing	30	0	70
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	47	0	53
• Industrial Machinery Mechanics and Repairmen	17	42	41
MATERIALS HANDLING AND RELATED	7	0	94
OTHER	0	17	83

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job content.

5.1 Effects on Occupations

Table 41 summarize firms' views on how technology will affect their occupational requirements. Respondents in many cases either expect a rough balance between their needs and skills availability or have no opinion. On balance, they expect that shortages may occur in the following areas:

- Managerial,
- Sciences and Engineering, excluding systems analysts,
- Machining, excluding machine tool operators and filing and grinding, and
- industrial machinery mechanics.

Oversupply is expected in:

- Processing,
- filing and grinding,
- fabricating and assembling metal products, and
- Materials Handling.

The views of respondents are evenly balanced in the remaining occupational areas such as system analysts and machine tool operators.

5.2 Likely Steps to Deal With Skills Oversupply

Respondents plan to use a wide variety of techniques in reducing or eliminating cases of oversupply.

Results of Question 7

TABLE 42: MISCELLANEOUS METAL FABRICATING INDUSTRY — SIC 309

Steps Firms Will Likely Take to Deal With an OVERSUPPLY of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Attrition	Early Retirement	Retrain
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Systems Analysts and Computer Programmers	Job Sharing	Shorter Hours	(1)
PROCESSING	Layoff	Retrain	Attrition
MACHINING			
• Tool and Die Making	Attrition	Upgrade	(1)
• Machinist and Machine Tool Setting-Up	Attrition	Retrain	(1)
• Machine-Tool Operators	Retrain	Layoff	Attrition
• Metal Shaping and Forming	Attrition	Retrain	(1)
• Filing, Grinding, Buffing, Cleaning and Polishing	Job Sharing	Downgrade	Attrition
FABRICATING, ASSEMBLING AND REPAIRING			
• Fabricating and Assembling Metal Products	Attrition	Shorter Hours	Layoff
• Industry Machinery Mechanics and Repairmen	Layoff	Shorter Hours	(1)
MATERIALS HANDLING AND RELATED	Attrition	Retrain	(1)

(1) Only 2 steps mentioned.

For example, job sharing is the most important step cited for such disparate occupations as filing and grinding and systems analysts. Attrition is a widely cited step but frequently in reference to occupations where very few respondents expect oversupply to develop. Other important steps include layoffs, shortening work hours and retraining. Respondents' views are recorded in Table 42.

5.3 Likely Steps to Deal With Skills Shortages

Recruiting and retraining are the most frequently cited methods that firms expect to use to overcome skills shortages. However, for some occupations, firms expect other steps to be significant. Upgrading qualifications of personnel is a frequently cited approach to answering employment needs in the Science and Engineering occupational group. Secondary techniques of importance in Machining occupations include the use of overtime and contracting work out. Table 43 presents the views of respondents.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to evaluate the expected impact of new technology on selected occupations in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

Table 44 shows that firms expect skill level requirements to rise for most occupations under the influence of technological change. Respondents are confident of their point of view with respect to Managerial, Science and Engineering occupations. However, they are cautious in extending this view to other positions. In many cases, the majority expects no change in skill requirements but respondents on balance foresee an increase.

Results of Question 8

TABLE 43: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Steps Firms Will Likely Take to Deal With a SHORTAGE of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Retrain	Recruit	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Recruit	Upgrade	Retrain
• Engineering Technicians and Technologists	Recruit	Retrain	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Upgrade	Contract Out
MACHINING			
• Tool and Die Making	Recruit	Contract Out	Retrain
• Machinist and Machine Tool Setting-Up	Retrain	Overtime	Recruit
• Machine-Tool Operators	Upgrade	Overtime	Contract Out
• Metal Shaping and Forming	Retrain	Upgrade	Overtime/ Recruit
FABRICATING, ASSEMBLING AND REPAIRING			
• Industry Machinery Mechanics and Repairmen	Recruit	Retrain	Upgrade
OTHER	Recruit	Retrain	(1)

(1) Only 2 steps mentioned.

Results of Question 9

TABLE 44: MISCELLANEOUS METAL FABRICATING INDUSTRY SIC 309

Impact of Technology on Skill Levels and Job Content

Occupations	Skills Required (1) Percent of Firms			Time to Achieve Proficiency (1) Percent of Firms			Knowledge of Firm's Operations (1) Percent of Firms		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	74	0	24	42	17	41	47	0	53
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	60	0	40	60	0	40	60	0	40
• Engineering Technicians and Technologists	64	9	27	55	9	36	45	0	55
• Systems Analysts and Computer Programmers	56	7	37	15	7	78	57	0	43
PROCESSING	23	11	66	23	12	65	11	0	89
MACHINING									
• Tool and Die Making	21	0	80	20	1	79	10	0	90
• Machinist and Machine Tool Tool Setting-Up	49	12	39	21	0	79	12	0	88
• Machine-Tool Operators	23	39	38	1	30	69	22	0	78
• Metal Shaping and Forming	25	25	50	7	19	74	18	0	82
• Filing, Grinding, Buffing, Cleaning and Polishing	1	17	82	1	1	98	0	0	100
FABRICATING, ASSEMBLING AND REPAIRING									
• Fabricating and Assembling Metal Products	26	8	66	1	8	91	1	8	91
• Industrial Machinery Mechanics and Repairmen	36	17	47	19	17	64	30	0	70
MATERIALS HANDLING AND RELATED	17	16	67	0	18	82	1	17	82

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

Machining occupations are viewed somewhat differently from the rest. No change in skill requirements is expected for metal shaping and forming tasks and a decrease is possible for machine-tool operators. Materials Handling will probably not experience a change in required skills as well.

Views on time required to achieve proficiency are similar to those on skills requirements. Again, Managerial and Natural Sciences occupations are generally expected to demand more time than previously. No change is expected in most of the other areas. Respondents believe that reductions in time requirements are possible for machine tool operators, materials handlers and perhaps for metal shaping and forming tasks and metal fabricating and assembling.

Respondents believe on balance that their firms' employees will need to acquire more knowledge of the firms operations than previously if they are to properly take advantage of new technology. These views are cautiously expressed for most occupations. Only materials handlers may escape this influence.

5.5 Training Costs and New Technology

Training costs make up approximately 5 percent of total labour costs in the industry. Small firms are slightly above the industry average while medium sized firms devote about 2.5 percent of labour costs to training. Large firms spend about the same share as the industry as a whole. Respondents do not expect this picture to change significantly to 1995.

Training costs related to new technology are expected to be about 30 percent of total training costs in the 1985 to 1995 period. This level is somewhat higher than it has been in the past. Large and medium sized firms expect to spend about 60 to 65 percent of training costs on training related to new technology while small firms will probably devote 20 to 25 percent of total training costs to this type of training.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

In 1982, the Miscellaneous Metal Fabricating Industry in Ontario had 7,118 unionized employees or 58 percent of the 12,235 total employed. The major unions in the industry are the United Steelworkers, which represents 42 percent of the unionized employees and the United Auto Workers, which represents a further 21 percent. Other unions involved in the industry's collective bargaining settlements are:

- Machinists
- Teamsters
- United Electrical Workers
- Molders
- Sheet Metal Workers
- Structural Iron Workers
- Graphic Communications
- Plumbers
- United Textile Workers
- Independent Locals
- Boiler Makers
- Novelty Workers
- Woodworkers
- Labourers

The major employers of unionized workers are Decor Metal Products, Dominion Forge Company Limited and Otaco Division of Redlaw Industries.

6.2 Trends in Unionization

The survey estimates that about 66 percent of firms in the

TABLE 45

INDUSTRIAL RELATIONS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

UNION	NUMBER OF MEMBERS	MAJOR EMPLOYER*	LOCATION	TECHNOLOGICAL CHANGE CLAUSES
UNITED STEELWORKERS	252	Otaco, Division of Redlaw Industries	Orillia	None
	250	Dresser Canada Inc.	Cambridge	None
	240	EMCO Limited	London	None
	232	Crane Canada Inc.	Brantford	None
	215	Canadian Coleman Co.	Toronto	Advance Notice
	184	Cambridge Brass, Division of Waltec Inc.	Cambridge	NA
	175	Homeware Industries Limited	Tottenham	NA
	163	Stelco Inc.	Gananoque	NA
	160	Welded Tube of Canada	Vaughan	NA
UNITED AUTO WORKERS	443	Decor Metal Products	Midland	None
	324	Dominion Forge Company Limited	Windsor	Advance Notice, Consultation, Trainig
	200	Canforge, Division of Toromont Industries	Welland	Training
	100	B & W Heat Treating 1975	Kitchener	NA
UNITED ELECTRICAL WORKERS	175	Welland Forge	Welland	NA
	106	General Drop Forge	Welland	NA
MACHINISTS	195	Canvil Ltd.	Simcoe	NA
	110	Crane Canada Inc.	Stratford	NA
TEAMSTERS				
	119	Abex Industries Dominion Brake Shoe Division	Niagara Falls	NA
	100	Chubb Security Safes Division of Chubb Industries Limited	Brampton	NA
GRAPHIC COMMUNICATIONS	175	Ethyl Packaging Ltd.	Scarborough	NA
MOLDERS	274	Rockwell International of Canada	Guelph	Training
	144	Kindred Industries	Midland	NA
SHEET METAL WORKERS	135	Chemical Valley Fabricating Co. Ltd.	Penetanguishene	NA
PLUMBERS				

* Employer with a union agreement covering 100 or more employees.
The union agreements above represent 62 percent of total unionized employees.

NA Information not available for firms with less than 100 employees, from Ontario Ministry of Labour Data base.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

industry have some degree of union representation. Virtually all large and medium sized firms have a union, while about 50 percent of small firms are in a similar position. Among firms with a union, about 65 percent of the workforce is unionized and this level is expected to prevail throughout the years to 1995. Large firms expect the level of unionization to drop slightly while other firms expect offsetting increases.

6.3 Technology Change Clauses

The survey reports that about 25 percent of contracts between management and union have a technology change clause. The two most important elements in these clauses are the ensuring of retraining for employees displaced by the introduction of new technology and provision for seniority consideration in displacement and other decisions arising from technological change.

Information from the Ontario Ministry of Labour supplements the picture for collective bargaining agreements in firms with 200 employees or more.

Only four of the nine agreements have clauses dealing with technological change. The clauses cover advance notice of technological innovations, training provisions for displaced employees and consultation between management and the union prior to technology implementation. This and other labour relations information is presented in Table 45.

6.4 Management's Perception of their Union's Position on New Technology

Management views union leadership as fairly receptive to or at least accepting of technological change. Although there has been resistance to innovation in the past, respondents view unions as being aware of the need to remain competitive. Important union concerns, they feel, are possible impact on membership in the

union coupled with employees' job security as well as having some role in controlling the rate of technological change. Firms also report that unions are more supportive than they would otherwise be if they are notified of coming changes at an early stage in the process. Employees then have some time to make changes to deal with innovations by retraining or job hunting.

Union views confirm this management perspective. Union leaders see themselves as accepting new technology provided that members are offered retraining opportunities. However, some note that not a great deal of technological change has occurred yet in their firms, indicating that the unions' acceptance of innovation may be more sternly tested in the next ten years than it has been to date. They also report that some employers could do better in introducing new technology than at present by considering its impacts before implementation thereby smoothing the transition to new manufacturing techniques.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Worker involvement is fairly low in production and sales decisions in most firms. The highest percentage of firms involving workers is at the division or plant level with just 24 percent of firms reporting having a formal mechanism.

Productivity and product quality get formal attention by 42 percent of the industry, involvement increasing with firm size. In contrast, just 24 percent of the industry has a formal mechanism to involve workers in decisions on technological change.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were asked to what extent management should involve workers in decisions regarding the adoption of new technologies.

Several firm respondents see the need for worker involvement in all stages of new technology adoption, from planning through to full scale production. This attitude becomes increasingly prevalent as firm size increases. Most of those who express more limited views stress the importance of providing employees with information about the process of technological change and advising them on likely job security impacts. Some express the opinion that the final decision on technological change must remain with management. A few firms go further than the rest, making this point central by asserting that there is really no role for workers to play in the decision making process other than to be kept informed on an informal basis. This view is partly based on the belief that workers have limited information on which to base their views on the subject, especially if they don't work permanently in one work area or on one machine exclusively.

Union respondents stress the importance of information and training as a basis for technological change. They see workers as having a lot to offer in the decision making and implementing stages in cases where workers have high skill levels or training which gives them experience on which to base their opinions. There is also some recognition of the management view that the final decision in adoption rests with the firms.

Results of Question 18

TABLE 46: MISCELLANEOUS METAL FABRICATING INDUSTRY

SIC 309

Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Small (20-99)	75	0	-	25	1 year	1.0
Medium (100-499)	60	20	2 years	40	5 years	2.0
Large (500+)	100	100	6 years	100	6 years	4.0
Total Firms	71	7	3 years	30	2 years	1.2

1. Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of the results appears in Table 46.

According to respondents, over 70 percent of the industry uses some form of strategic planning. Human resource planning tends to be undertaken mostly by large firms and not at all by small firms. Capital investment plans to deal with new technology are more widespread than human resource plans but, here again, larger firms tend to be more likely to have them than smaller firms. Large firms also have a longer planning horizon in both cases than do small and medium sized firms, as well as a higher degree of integration in the planning process.

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I to III in each Section.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Metal Fabricating Industry	Part I
B	Questionnaires	Part I
	Responses by Question	Part III
	o Metal Stamping, Pressing and Coating	
	o Hardware Tool and Cutlery	
	o Miscellaneous Metal Fabricating	
C	Reliability of the Sample	Part I
D	Historical Tables	Part II
Page D.1	o Metal Stamping, Pressing and Coating	
Page D.9	o Hardware Tool and Cutlery	
Page D.16	o Miscellaneous Metal Fabricating	

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE METAL FABRICATING INDUSTRY

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE METAL FABRICATING INDUSTRY

Size Categories Used to Stratify the Sample Frame		Size Categories Used to Weight and Report Survey Results	
Number of Employees			Number of Employees
20 - 49		Small	20 - 99
50 - 99			
100 - 199		Medium	100 - 499
200 - 499			
500 - 999		Large	500 or more
1000 - 1499			
1500 - 2499			
2500 - 4999			
5000 or more			

APPENDIX B

QUESTIONNAIRES

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON
EMPLOYMENT AND NEW TECHNOLOGY

METAL FABRICATING INDUSTRIES:
MISCELLANEOUS METAL FABRICATING INDUSTRY
(SIC 309)
QUESTIONNAIRE

Currie, Coopers
& Lybrand
Management
Consultants

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their firm before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your firm's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the firm's future direction.

(SIC 309)

EXHIBIT A

SELECTED OCCUPATIONS: METAL FABRICATING INDUSTRIES, SIC 304, 306, 309.

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support functions such as personnel officers, financial officers).

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Engineers.
Engineering Technicians & Technologists.
Systems Analysts & Computer Programmers.

PROCESSING (includes materials processing occupations such as in metal processing: refining, smelting, heat treating, rolling, moulding, casting, extruding, plating, testing and inspecting).

MACHINING
Tool & Die Making.
Machinist & Machine-Tool Set-Up.
Machine-Tool Operators.
Metal Shaping & Forming.
Filing, Grinding, Buffing, Cleaning & Polishing.

FABRICATING, ASSEMBLING & REPAIRING

Fabricating & Assembling Metal Products.
Industrial Machinery Mechanics & Repairmen.

MATERIAL HANDLING & RELATED (includes such occupations as hoisting, material handling equipment operators and packaging).

(SIC 309)

The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your firm's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

(SIC 309)

PARTICIPANT INFORMATION

COMPANY NAME: _____

UNION NAME (If appropriate): _____

AFFILIATED ORGANIZATIONS: _____

MAIN ADDRESS: _____

TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

Divisions/Branches/Affiliates	Products/Services
_____	_____
_____	_____
_____	_____
_____	_____

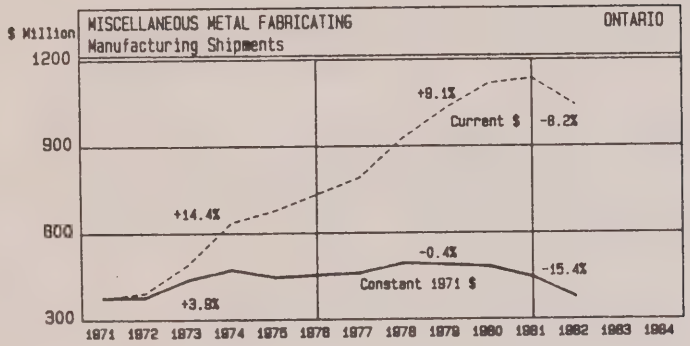
SURVEY PARTICIPANTS

Names	Position	Number of Years With Company	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(principal respondent)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(other respondents)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐

(SIC 309)

CHART 1

INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO*



* Source: Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. Graph, constant dollar calculation and rates of change by Economics Practice, Currie, Coopers & Lybrand.

(SIC 309)

1. INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO

Chart 1, opposite, illustrates manufacturing shipments for the Miscellaneous Metal Fabricating Industry in ONTARIO in current dollars (dotted line) and in constant dollars (current dollars adjusted for price changes, solid line).

The rates shown for the first three time periods listed below are expressed in annual compound rates of change (in constant dollars).

Using these rates as a guide, please **estimate** the annual compound rates of change (in constant dollars) of your industry's value of manufacturing shipments in Ontario for the next five periods listed.

Manufacturing Shipments in Ontario	Annual Compound Rate of Change (in constant dollars)
1971 to 1976	+3.9 %
1976 to 1981	-0.4 %
1981 to 1982	-15.4 %
	Your Estimates (Indicate if + or -)
1982 to 1983?	____ %
1983 to 1984?	____ %
1984 to 1985?	____ %
1985 to 1990?	____ %
1991 to 1995?	____ %

(SIC 309)

2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for employment in the Miscellaneous Metal Fabricating Industry in ONTARIO between 1971 and 1983. (Statistics Canada, Cat. No. 31-203).

Would you please indicate your estimates for the five following periods listed below (i.e., 1983-1995). Provide your estimates in actual numbers or in annual compound rates of change, whichever is easier.

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e., total "head count".

Total Employment in Ontario		Annual Compound Rates of Change	
1971	13,532		
1981	14,693	1971-1981	+0.8 %
1983	12,235	1981-1982	-16.7 %

Your Estimates:

				(Indicate if + or -)
1983?	_____	OR	1982-1983?	____ %
1984?	_____	OR	1983-1984?	____ %
1985?	_____	OR	1984-1985?	____ %
1990?	_____	OR	1985-1990?	____ %
1995?	_____	OR	1990-1995?	____ %

(SIC 309)

3. FIRM'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your firm has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your firm. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your firm between 1985 and 1990. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your firm between 1991 and 1995. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY THE FIRM

	3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1991-1995?
1. DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	☐	☐	☐
Computer-Aided Engineering (CAE)	☐	☐	☐
CAD/CAM Integration	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
2. MANUFACTURING PLANNING & CONTROL SYSTEMS			
Computerized Financial Systems	☐	☐	☐
Computerized Order Entry/Inventory Control	☐	☐	☐
Computer-Aided Process Planning	☐	☐	☐
Manufacturing Resource Planning Systems (MRP)	☐	☐	☐
Automated Shop Floor Data Collection	☐	☐	☐
Computerized Decision Support Systems	☐	☐	☐
Computerized Maintenance Planning & Control	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
3. MANUFACTURING PROCESS TECHNOLOGIES			
Numerically Controlled Machines (NC)	☐	☐	☐
Computer Controlled CN Machines (CNC)	☐	☐	☐
CAD Directed CNC	☐	☐	☐
Automatic Casting/Molding ("Near Net" Casting)	☐	☐	☐
Computerized Process Control Systems	☐	☐	☐
Computer-Aided Inspection & Testing	☐	☐	☐
Robotic Applications	☐	☐	☐
Flexible Manufacturing Technologies	☐	☐	☐
Computer Integrated Manufacturing (CIM)			
Any Others? _____			
4. MATERIALS HANDLING TECHNOLOGIES	☐	☐	☐
Automatic Bulk Handlers/Feeder Systems	☐	☐	☐
Automated Conveyor/Vehicle Systems	☐	☐	☐
Automated Storage & Retrieval	☐	☐	☐
Computer Controlled Conveyor/Vehicles	☐	☐	☐
Automated Warehouse	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
5. TELECOMMUNICATIONS TECHNOLOGIES	☐	☐	☐
Facsimile (FAX) Link: HO/Plants	☐	☐	☐
Computer Link: HO/Plant(s)	☐	☐	☐
Computer Link: Suppliers/Customers	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
6. OTHER TECHNOLOGIES	☐	☐	☐
_____	☐	☐	☐
_____			
HAVE/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

(SIC 309)

4. FORCES DRIVING THE FIRM'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your firm's internal or external environment which could accelerate your **firm's need to adopt** these new technologies over the next 10 years in ONTARIO?

4b. What is the **second most important factor** likely to accelerate your firm's need to adopt these new technologies?

4c. And what is the **third most important** factor?

5. FACTORS AFFECTING THE FIRM'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your firm's internal or external environment that could slow down the speed at which your firm will adopt these new technologies over the next 10 years in ONTARIO?

5b. What is the **second most important** factor that could slow down your firm's adoption of these new technologies?

5c. And what is the **third most important** factor?

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your firm over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your firm is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6A.

6b. Please indicate the **occupations** in which you expect your firm will have a **shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6B.

(SIC 309)

CHART 6

IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS
IN YOUR FIRM OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
PROCESSING	☐	☐
MACHINING		
• Tool & Die Making	☐	☐
• Machinist & Machine-Tool Set-Up	☐	☐
• Machine-Tool Operators	☐	☐
• Metal Shaping & Forming	☐	☐
• Filing, Grinding, Buffing, Cleaning & Polishing	☐	☐
FABRICATING, ASSEMBLING & REPAIRING		
• Fabricating & Assembling Metal Products	☐	☐
• Industrial Machinery Mechanics & Repairmen	☐	☐
MATERIAL HANDLING AND RELATED	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

(SIC 309)

7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN FIRM OVER NEXT 10 YEARS

The following questions relate to the actions your firm will likely take to deal with the oversupply of people in your firm resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the **steps** your firm will likely take that will affect the **largest number of people** in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your firm is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc. etc.,

7b. Again, for each of these occupations, identify the step your firm may take that will affect the **second largest number of people** in that occupation. Record on Chart 7, under column 7b.

(SIC 309)

CHART 7

STEPS FIRM WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Tool & Die Making		
• Machinist & Machine-Tool Set-Up		
• Machine-Tool Operators		
• Metal Shaping & Forming		
• Filing, Grinding, Buffing, Cleaning & Polishing		
FABRICATING, ASSEMBLING & REPAIRING		
• Fabricating & Assembling Metal Products		
• Industrial Machinery Mechanics & Repairmen		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		

8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your firm may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the step your firm will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your firm is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of firm's skilled people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc...

8b. Please indicate, for each occupation, the step your firm may take that will affect the second largest number of people in that occupation. Record your answers in column 8b.

CHART 8
STEPS FIRM WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Tool & Die Making		
• Machinist & Machine-Tool Set-Up		
• Machine-Tool Operators		
• Metal Shaping & Forming		
• Filing, Grinding, Buffing, Cleaning & Polishing		
FABRICATING, ASSEMBLING & REPAIRING		
• Fabricating & Assembling Metal Products		
• Industrial Machinery Mechanics & Repairmen		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the nature of the impact on selected occupations in ONTARIO.

9a. For selected occupations in your firm, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require. Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the company's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

(SIC 309)

CHART 9

IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE, & RELATED	___	___	___	_____
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Engineers	___	___	___	_____
• Engineering Technicians & Technologists	___	___	___	_____
• Systems Analysts & Computer Programmers	___	___	___	_____
PROCESSING	___	___	___	_____
MACHINING				
• Tool & Die Making	___	___	___	_____
• Machinist & Machine-Tool Set-Up	___	___	___	_____
• Machine-Tool Operators	___	___	___	_____
• Metal Shaping & Forming	___	___	___	_____
• Filing, Grinding, Buffing, Cleaning & Polishing	___	___	___	_____
FABRICATING, ASSEMBLING & REPAIRING				
• Fabricating & Assembling Metal Products	___	___	___	_____
• Industrial Machinery Mechanics & Repairmen	___	___	___	_____
MATERIAL HANDLING AND RELATED	___	___	___	_____
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	_____
_____	___	___	___	_____
_____	___	___	___	_____

(SIC 309)

10. TRAINING/RETRAINING

These questions are about the current and future importance of **training and retraining** in your organization.

10a. Please indicate what were your firm's total training costs as a percent of total labour costs in **1981**. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your firm, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your firm's total training costs as a percent of total labour costs will be in **1984** (to year end). Record your answer on line 10b.

10c. What do you estimate for **1985**, (line 10c)?

10d. What do you estimate it will be in **1990**, (line 10d)?

10e. What do you estimate it will be in **1995**, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

(SIC 309)

CHART 10

TRAINING COSTS OF FIRM

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

(SIC 309)

11. FIRM'S EMPLOYMENT TRENDS

In this section, we would like to determine how the firm's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your firm's internal and external environment, what is the **single most important factor** which will have an impact on your firm's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The **second most important factor?** _____

_____

11c. The **third most important factor?** _____

_____

11d. Please indicate **total employees** (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for **1971, 1981 and 1984** from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for **1985, 1990 and 1995.**

11e. Please indicate the **percent** of your total employment in ONTARIO that are **part-time employees** (i.e., less than normal full work week), for **1981 and 1984.** Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for **1985, 1990 and 1995.**

(SIC 309)

11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (F.T.E.) figure for your firm for 1981 and 1984 in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for 1985, 1990 and 1995.

By **F.T.E.** we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your firm or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

FIRM'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

(SIC 309)

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your firm in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of each occupation listed as a percent of your firm's total employment in ONTARIO in 1981. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of each selected occupation listed as a percent of your firm's total employment in ONTARIO in 1984. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in 1985. Record in column 12c.

12d. Please estimate the same for each selected occupation in 1990. Record in column 12d.

12e. Please estimate the same for each selected occupation in 1995. Record in column 12e.

(SIC 309)

CHART 12

TRENDS IN FIRM'S OCCUPATIONAL STRUCTURE BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED	☐	☐	☐	☐	☐	1a
NATURAL SCIENCE, ENGINEERING & MATHEMATICS	☐	☐	☐	☐	☐	2a
• Engineers	___	___	___	___	___	
• Engineering Technicians & Technologists	___	___	___	___	___	
• Systems Analysts & Computer Programmers	___	___	___	___	___	
• All Other Natural Science, & Mathematics (not listed above)	___	___	___	___	___	
PROCESSING	☐	☐	☐	☐	☐	3a
MACHINING	☐	☐	☐	☐	☐	4a
• Tool & Die Making	___	___	___	___	___	
• Machinist & Machine-Tool Set-Up	___	___	___	___	___	
• Machine-Tool Operators	___	___	___	___	___	
• Metal Shaping & Forming	___	___	___	___	___	
• Filing, Grinding, Buffing, Cleaning & Polishing	___	___	___	___	___	
• All Other Machining (not listed above)						
FABRICATING, ASSEMBLING & REPAIRING	☐	☐	☐	☐	☐	5a
• Fabricating & Assembling Metal Products	___	___	___	___	___	
• Industrial Machinery Mechanics & Repairmen	___	___	___	___	___	
• All Other Fabricating, Assembling, & Repairing (not listed above)	___	___	___	___	___	
MATERIAL HANDLING AND RELATED	☐	☐	☐	☐	☐	6a
ALL OTHER OCCUPATIONS	☐	☐	☐	☐	☐	7a
* FIRM'S TOTAL EMPLOYMENT IN ONTARIO (1+2+3+4+5+6+7 = 100%)	100%	100%	100%	100%	100%	

(SIC 309)

13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your firm's employment in ONTARIO by sex for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO by each occupation in 1981. Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO in 1984. Record your answer in Column 13b.

(SIC 309)

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT MALE	FEMALE	TOTAL	13b 1984 EMPLOYMENT MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED	___% +	___%	=100%	___% +	___%	=100%
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						
• Engineers	___% +	___%	=100%	___% +	___%	=100%
• Engineering Technicians & Technologists	___% +	___%	=100%	___% +	___%	=100%
• Systems Analysts & Computer Programmers	___% +	___%	=100%	___% +	___%	=100%
PROCESSING	___% +	___%	=100%	___% +	___%	=100%
MACHINING						
• Tool & Die Making	___% +	___%	=100%	___% +	___%	=100%
• Machinist & Machine-Tool Set-Up	___% +	___%	=100%	___% +	___%	=100%
• Machine-Tool Operators	___% +	___%	=100%	___% +	___%	=100%
• Metal Shaping & Forming	___% +	___%	=100%	___% +	___%	=100%
• Filing, Grinding, Buffing, Cleaning & Polishing	___% +	___%	=100%	___% +	___%	=100%
FABRICATING ASSEMBLING & REPAIRING						
• Fabricating & Assembling Metal Products	___% +	___%	=100%	___% +	___%	=100%
• Industrial Machinery Mechanics & Repairmen	___% +	___%	=100%	___% +	___%	=100%
MATERIAL HANDLING AND RELATED	___% +	___%	=100%	___% +	___%	=100%
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% +	___%	=100%	___% +	___%	=100%

(SIC 309)

14. ORGANIZED LABOUR IN YOUR FIRM IN ONTARIO

14a. Does your firm have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ If no, go on to Question 14c.

14b. If yes, what percent of your firm's total employment in ONTARIO is currently (1984) unionized?

_____%

14c. What percent of your firm's total employment in ONTARIO do you estimate will be unionized by 1985, 1990 and by 1995?

- 1985? _____%
- 1990? _____%
- 1995? _____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your firm in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your firm in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your firm in ONTARIO. Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the firm's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your firm the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Seniority
- Job Security
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Firm			
15b. Number of Firm's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

(SIC 309)

15g. In general, what has been the union's position on the adoption of new technologies in your firm? Please explain.

_____

_____

_____

_____

_____

(SIC 309)

16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the **relationship between workers and management** in your firm as decisions are made on the adoption of new technology.

16a. Does your firm have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
– at company level?	☐	☐
– at division/plant level?	☐	☐
– at department/area level?	☐	☐
– at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies. Please comment.

_____

_____

_____

_____

_____

_____

(SIC 309)

17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, **in today's dollars**, your firm plans to spend on **construction of structures and buildings** in ONTARIO over the period 1985 to 1990 and over the period 1991 to 1995. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of **new technologies**? Record under column 17a.

17c. Would you indicate how much, **in today's dollars**, your firm plans to spend on **machinery and equipment** over the period 1985 to 1990 and over the period 1991 to 1995 in ONTARIO. Record under column 17c.

17d. What percent of this spending on **machinery and equipment** will be for **new technologies**? Record under column 17d.

17e. Please indicate what criterion your firm will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____ If Yes, how long?

Return on investment ☐ _____ If Yes, what rate?

Other _____ ☐ _____ Please elaborate
(specify)

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ____%
External funds ____%
100%

(SIC 309)

CHART 17

CAPITAL INVESTMENT PLANS
IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

(SIC 309)

18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your firm's plans for adopting new technologies in ONTARIO.

18a. Does your firm currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your firm have a plan to deal with future human resource needs?

Yes ☐ No ☐ If no, go to Question 18d.

18c. Up to what year has your firm planned for its human resource needs?

_____

(WRITE IN YEAR)

18d. Does your firm have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ If no, go to Question 19. on p. 25.

18e. Up to what year has your firm planned for its capital requirements?

_____

(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated.

(Please circle answer)

NOT AT ALL INTEGRATED	1	2	3	4	5	HIGHLY INTEGRATED

(SIC 309)

19. Please indicate below any other comments on the issue of employment and new technology you wish to make.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

(SIC 309)

METAL STAMPING, PRESSING AND COATING INDUSTRY

Number of Firms and Unions Responding by Question

Question		Firms	Unions	Question		Firms	Unions
Question 1	1982-1983	13	3	Question 12	a,b,c,d,e	11	0
	1983-1984	13	3				
	1984-1985	13	3				
	1985-1990	13	3	Question 13		*	*
	1990-1995	13	2				
Question 2		*	*	Question 14	a	13	3
					b	8	3
					c	14	3
Question 3	a,b,c	14	3		d	1	0
Question 4	a,b,c	14	3	Question 15	a	6	3
					b	3	3
					c	*	*
Question 5	a,b,c	13	2		d	5	3
					e	3	2
					f	3	2
Question 6	a,b	13	3		g	4	3
Question 7	a	7	3	Question 16	a	13	3
	b	6	3		b	12	1
Question 8	a	13	3	Question 17	a	12	0
	b	10	3		b	12	0
					c	14	0
					d	14	0
Question 9	a	12	3		e	12	0
	b	12	3		f	12	0
	c	12	3				
				Question 18	a	14	1
Question 10	a,b,c,d,e	13	3		b	14	1
					c	5	1
Question 11	a,b,c,	13	2		d	12	1
	d	14	3		e	10	1
	e	13	2		f	11	1
	f	14	2				

* Data not used and therefore, number of responses not reported.

HARDWARE, TOOL AND CUTLERY INDUSTRY

Number of Firms and Unions Responding by Question

Question		Firms	Unions	Question		Firms	Unions
Question 1	1982-1983	11	4	Question 12	a,b,c,d,e	9	1
	1983-1984	11	4				
	1984-1985	11	4				
	1985-1990	11	4	Question 13		*	*
	1990-1995	10	4				
Question 2		*	*	Question 14	a	11	6
					b	5	5
					c	11	5
Question 3	a,b,c	11	5		d	0	3
Question 4	a,b,c	11	6	Question 15	a	4	5
					b	5	5
					c	*	*
Question 5	a,b,c	11	6		d	5	6
					e	1	2
					f	0	2
Question 6	a,b	11	6		g	5	5
Question 7	a	9	5	Question 16	a	11	6
	b	6	4		b	7	5
Question 8	a	11	5	Question 17	a	10	1
	b	11	4		b	10	1
					c	10	1
					d	9	1
Question 9	a	10	6		e	10	1
	b	11	6		f	10	1
	c	11	6				
				Question 18	a	11	3
Question 10	a,b,c,d,e	11	1		b	10	3
					c	6	1
Question 11	a,b,c,	10	4		d	11	3
	d	11	2		e	8	2
	e	9	1		f	7	1
	f	10	0				

* Data not used and therefore, number of responses not reported.

MISCELLANEOUS METAL FABRICATING INDUSTRIES

Number of Firms and Unions Responding by Question

Question		Firms	Unions	Question		Firms	Unions
Question 1	1982-1983	10	0	Question 12	a,b,c,d,e	11	0
	1983-1984	10	1				
	1984-1985	10	1				
	1985-1990	11	1	Question 13		*	*
	1990-1995	11	1				
Question 2		*	*	Question 14	a	11	6
					b	10	5
					c	11	5
Question 3	a,b,c	11	3		d	2	3
Question 4	a,b,c	11	4	Question 15	a	9	5
					b	9	5
					c	*	*
Question 5	a,b,c	11	4		d	9	6
					e	3	1
					f	3	1
Question 6	a,b	11	4		g	8	5
Question 7	a	9	4	Question 16	a	11	6
	b	6	4		b	11	6
Question 8	a	10	4	Question 17	a	11	0
	b	8	4		b	11	0
					c	11	0
					d	11	0
Question 9	a	11	4		e	10	0
	b	11	4		f	8	0
	c	11	4				
				Question 18	a	11	1
Question 10	a,b,c,d,e	10	1		b	11	1
					c	3	0
Question 11	a,b,c,	10	3		d	11	1
	d	11	3		e	5	0
	e	10	3		f	6	0
	f	11	1				

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

Manufacturing Sector		Service Sector
Small	20- 99 employees	20-199 employees
Medium	100-499 employees	200-999 employees
Large	500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR		ORGANIZATION SIZE EXCLUSION
Manufacturing Sector		
291	Iron & Steel Mills	less than 500
321	Aircraft & Aircraft Parts	less than 50
Service Sector		
701	Banks and Trusts	less than 50
721	General and Life Insurance	less than 50
735	Insurance Brokers	less than 50
909	Federal Government	less than 500
931	Provincial Government	less than 200
951	Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For instance, the sample for the Metal Stamping, Pressing and Coating Industry yields a minimum confidence level of about 99 percent with an associated allowable error of 5 percent. That is, we would expect that the estimated employment level for the sector has a 99 percent chance of being within $\pm$ 5 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 99 of these samples we would expect to have an estimated employment level within $\pm$ 5 percent of the actual employment level found in the sample frame.

TABLE 1: SUMMARY - SELECTED MANUFACTURING INDUSTRIES

SAMPLE FRAME AND SAMPLE

SIC Code	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE			
		Number of Firms	Number of[1] Employees	Firm Size Cut Off	Number of Firms	Number of[2] Employees	Share of Universe	Number of Firms	Number of Unions	Number of[3] Employees	Reliability Level (min.
291	Iron and Steel Mills	17	41,603	500	7	39,900	96	3	1	21,833	90
304	Metal Stamping, Pressing and Coating Industry	185	17,730	20	145	17,200	97	14	3	4,507	99
306	Hardware, Tool and Cutlery Manufacturing	225	12,826	20	135	11,500	90	11	6	1,489	94
309	Miscellaneous Metal Fabricating Industries	132	12,235	20	110	12,000	98	11	6	2,694	99
315	Miscellaneous Machinery and Equipment Manufacturers	304	36,904	20	262	36,500	99	12	3	3,972	99
318	Office and Store Machinery Manufacturers	29	10,485	20	29	9,800	93	7	0	11,814	99
335	Communications Equipment Manufacturers	67	28,090	20	65	27,800	99	12	2	14,946	90
321	Aircraft and Aircraft Parts Manufacturers	22	12,732	50	17	12,000	94	10	5	11,737	95
165	Plastic Processing	196	19,218	20	169	18,800	98	13	4	2,400	99

(1) Source: Census of Manufacturing, 1982, Statistics Canada, Catalogue No. 31-203.

(2) Rounded to nearest 100.

(3) Sum of firms' estimates for 1984, rounded to nearest 100.

HISTORICAL TABLES

- D.1 The Metal Stamping, Pressing and Coating Industry
- D.9 The Hardware, Tool and Cutlery Manufacturing Industry
- D.16 Miscellaneous Metal Fabricating Industries

TABLE D.1

MAJOR PRODUCTS OF THE CANADIAN METAL COATING INDUSTRY

	Value of Shipments In 1981 ($ Millions)	Percent of Total Shipments
Custom electroplating	86.9	32.3
Custom painting	54.7	20.3
All other products (including unspecified items)	37.7	14.0
Other *	36.5	13.6
Custom galvanizing	25.6	9.5
Automobile parts and accessories	10.5	3.9
Custom anodizing	9.8	3.6
Custom polishing	5.0	1.9
Custom enamelling	2.5	0.9
TOTAL	269.1	100.0

* Includes other receipts, adjustments and estimate for small establishments not not reporting in detail.

NOTE: Figures may not add to totals due to rounding.

SOURCE: Statistics Canada, Metal Stamping, Pressing and Coating Industry, Cat. No. 41-227, Table 5.

TABLE D.2

MAJOR PRODUCTS OF THE METAL STAMPING AND PRESSING INDUSTRY

	Value of Shipments In 1981 ($ Millions)	Percent of Total Shipments
Stampings, all metals (including coins and automotive)	852.3	25.1
Metal cans for food	399.4	11.8
Metal cans for nonfood	305.9	9.0
Siding sheets	232.6	6.9
Containers and closures	100.1	3.0
Heating equipment	99.3	2.9
Culvert pipe	66.3	2.0
Kitchenware - cooking utensils	63.3	1.9
Miscellaneous metal building materials	59.4	1.8
Roof deck	39.6	1.2
Hotel, motel, restaurant, store and office fixtures	33.7	1.0
Tanks	32.3	1.0
Roofing sheets	30.8	0.9
Ceiling partitions and panels, metal	29.0	0.9
Other miscellaneous products *	1,046.5	30.9
TOTAL	3,390.4	100.0

* Includes other miscellaneous products, adjustments and estimate for establishments not reporting in detail.

NOTE: Figures may not add to totals due to rounding.

SOURCE: Statistics Canada, Metal Stamping, Pressing and Coating Industry, Cat.No 41-227, Table 5.

TABLE D.3

METAL STAMPING, PRESSING & COATING INDUSTRY (SIC 304)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	424	391	379	405	404	397	386	447	473	471	474	458		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	616.8	657.4	756.8	899.0	931.8	1,087.6	1,253.8	1,520.4	1,731.6	1,740.5	1,953.7	1,786.5		
MANUFACTURING VALUE ADDED	271.3	292.2	334.9	420.4	411.9	478.9	517.9	623.0	715.2	708.8	798.1	722.5		
WAGES & SALARIES	145.8	154.3	179.4	209.0	214.4	253.1	271.3	318.2	343.4	349.3	382.5	380.6		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	14,161	14,067	15,366	15,398	15,109	15,940	15,547	17,221	16,712	15,061	14,441	13,631		
ADMINISTRATIVE STAFF	4,317	4,054	4,164	4,560	3,836	4,186	4,252	4,429	4,391	4,382	4,621	4,099		
TOTAL	18,478	18,121	19,530	19,958	18,945	20,126	19,799	21,650	21,103	19,443	19,062	17,730		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	3.9	4.3	10.4	11.8	10.0	9.1	12.7	11.1	17.0	20.9	16.8	6.1	9.9	25.3
MACHINERY & EQUIPMENT	15.7	24.4	27.7	29.7	34.5	39.4	43.9	49.2	68.6	84.1	74.2	54.9	63.9	91.4
TOTAL	19.6	28.7	38.1	41.5	44.5	48.5	56.6	60.3	85.6	105.0	91.0	61.0	73.8	116.7
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	14,680	16,122	17,146	21,064	21,741	23,797	26,159	28,777	33,889	36,454	41,871	40,753		
VALUE ADDED/$ LABOUR (SIC 304)	1.86	1.89	1.87	2.01	1.92	1.89	1.91	1.96	2.08	2.03	2.09	1.90		
VALUE ADDED/$ LABOUR (SIC 304, 306 and 309)	1.81	1.82	1.83	1.96	1.88	1.82	1.85	1.91	1.99	1.96	2.00	1.87		
VALUE ADDED/$ LABOUR (United States)	1.99	1.95	1.99	2.13	2.09	2.13	2.16	2.16	2.22	2.17	2.16	2.14		
EXPORTS ($ Million)	3.6	7.7	11.0	14.7	7.8	14.0	22.5	30.8	35.1	29.2	30.8	20.1	28.6	
IMPORTS ($ Million)	32.7	40.9	53.3	68.1	66.6	71.3	80.4	93.3	109.2	112.2	127.5	116.0	137.3	
TRADE BALANCE ($ Million)	(29.1)	(33.2)	(42.3)	(53.4)	(58.8)	(57.2)	(57.9)	(62.5)	(74.1)	(83.1)	(96.6)	(95.9)	(108.6)	
NORMALIZED TRADE BALANCE	(0.801)	(0.682)	(0.658)	(0.645)	(0.791)	(0.671)	(0.563)	(0.504)	(0.514)	(0.587)	(0.610)	(0.705)	(0.655)	

( ) indicates deficit

NOTE: Data excludes Machinery and Transportation Equipment industries. Capacity Utilization Rate shown is for total Metal Fabricating. Value Added/$ Labour (United States) is for the total of SIC 304, 306 and 309.

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA: NATIONAL AND PROVINCIAL AREAS, Cat. No. 31-203; CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING, Cat. No. 31-003; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand. Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D4

METAL STAMPING, PRESSING & COATING INDUSTRY (SIC 304)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-7.8	-3.1	6.9	-0.2	-1.7	-2.8	15.8	5.8	-0.4	0.6	-3.4		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	6.6	15.1	18.8	3.7	16.7	15.3	21.3	13.9	0.5	12.2	-8.6		
MANUFACTURING VALUE ADDED	7.7	14.6	25.5	-2.0	16.3	8.1	20.3	14.8	-0.9	12.6	-9.5		
WAGES & SALARIES	5.8	16.3	16.5	2.6	18.0	7.2	17.3	7.9	1.7	9.5	-0.5		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	-0.7	9.2	0.2	-1.9	5.5	-2.5	10.8	-3.0	-9.9	-4.1	-5.6		
ADMINISTRATIVE STAFF	-6.1	2.7	9.5	-15.9	9.1	1.6	4.2	-0.9	-0.2	5.5	-11.3		
TOTAL	-1.9	7.8	2.2	-5.1	6.2	-1.6	9.3	-2.5	-7.9	-2.0	-7.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	10.3	141.9	13.5	-15.3	-9.0	39.6	-12.6	53.2	22.9	-19.6	-63.7	62.3	155.6
MACHINERY & EQUIPMENT	55.4	13.5	7.2	16.2	14.2	11.4	12.1	39.4	22.6	-11.8	-26.0	16.4	43.0
TOTAL	46.4	32.8	8.9	7.2	9.0	16.7	6.5	42.0	22.7	-13.3	-33.0	21.0	58.1
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	9.8	6.4	22.8	3.2	9.5	9.9	10.0	17.8	7.6	14.9	-2.7		
EXPORTS	114.3	42.6	33.5	-47.1	80.3	60.4	36.8	13.9	-16.8	5.7	-34.9	42.6	
IMPORTS	25.2	30.3	27.7	-2.2	7.0	12.9	16.0	17.0	2.8	13.6	-9.0	18.3	

SOURCE: Calculated from Table D3 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D5

METAL STAMPING, PRESSING & COATING INDUSTRY (SIC 304)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	424	391	379	405	404	397	386	447	473	471	474	458		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	616.8	632.7	686.2	728.5	642.2	682.3	731.5	806.6	826.5	758.4	770.4	643.1		
MANUFACTURING VALUE ADDED	271.3	275.4	293.2	325.1	273.0	305.6	311.1	330.0	350.6	313.8	274.3	237.8		
WAGES & SALARIES	145.8	148.4	160.7	168.3	156.1	170.4	169.1	184.2	182.0	167.2	163.9	147.1		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	14,161	14,067	15,366	15,398	15,109	15,940	15,547	17,221	16,712	15,061	14,441	13,631		
ADMINISTRATIVE STAFF	4,317	4,054	4,164	4,560	3,836	4,186	4,252	4,429	4,391	4,382	4,621	4,099		
TOTAL	18,478	18,121	19,530	19,958	18,945	20,126	19,799	21,650	21,103	19,443	19,062	17,730		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	3.9	4.1	9.1	8.9	6.7	5.7	7.5	6.1	8.6	9.4	6.8	2.2	3.5	8.6
MACHINERY & EQUIPMENT	15.7	23.8	25.9	24.4	24.8	26.8	27.4	27.5	34.9	38.8	30.6	21.0	23.7	32.2
TOTAL	19.6	27.9	35.0	33.3	31.5	32.5	34.9	33.6	43.5	48.2	37.4	23.2	27.2	40.8
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	14,680	15,195	15,014	16,291	14,408	15,187	15,711	15,242	16,612	16,137	14,389	13,410		

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for SIC 304; Value Added deflated by the Implicit Price Index for Gross Domestic Product for SIC 304; Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D3. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D6

METAL STAMPING, PRESSING & COATING INDUSTRY (SIC 304)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-7.8	-3.1	6.9	-0.2	-1.7	-2.8	15.8	5.8	-0.4	0.6	-3.4		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	2.6	8.5	6.2	-11.9	6.2	7.2	10.3	2.5	-8.2	1.6	-16.5		
MANUFACTURING VALUE ADDED	1.5	6.5	10.9	-16.0	12.0	1.8	6.1	6.2	-10.5	-12.6	-13.3		
WAGES & SALARIES	1.7	8.3	4.7	-7.2	9.1	-0.8	9.0	-1.2	-8.1	-2.0	-10.3		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	-0.7	9.2	0.2	-1.9	5.5	-2.5	10.8	-3.0	-9.9	-4.1	-5.6		
ADMINISTRATIVE STAFF	-6.1	2.7	9.5	-15.9	9.1	1.6	4.2	-0.9	-0.2	5.5	-11.3		
TOTAL	-1.9	7.8	2.2	-5.1	6.2	-1.6	9.3	-2.5	-7.9	-2.0	-7.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	5.1	122.0	-2.2	-24.7	-14.9	31.6	-18.7	41.0	9.3	-27.7	-67.6	59.1	145.7
MACHINERY & EQUIPMENT	51.6	8.8	-5.8	1.6	8.1	2.2	0.4	26.9	11.2	-21.1	-31.4	12.9	35.9
TOTAL	42.3	25.4	-4.9	-5.4	3.2	7.4	-3.7	29.5	10.8	-22.4	-38.0	17.2	50.0
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	3.5	-1.2	8.5	-11.6	5.4	3.5	-3.0	9.0	-2.9	-10.8	-6.8		

SOURCE: Calculated from Table D5 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.7

OCCUPATIONAL INDICATORS: METAL STAMPING, PRESSING AND COATING INDUSTRY

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
I.	TOTAL INDUSTRY	20,890	2.3
II.	TWO DIGIT LEVEL		
	MACHINING AND RELATED	8,090	2.2
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	1,980	2.4
	MATERIAL HANDLING AND RELATED	1,185	3.2
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	675	6.1
	PROCESSING	2,260	7.0
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,600	7.2
II.	FOUR DIGIT LEVEL		
	MACHINING AND RELATED		
	Machine-Tool Operating	135	(10.7)
	Foremen, Metal Machining	125	(3.6)
	Machinist and Machine-Tool Setting-Up	440	(2.3)
	Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	420	0.7
	Welding and Flame Cutting	995	1.6
	Metalworking-Machine Operators, n.e.c.	2,110	2.4
	Inspecting and Testing, Metal Shaping and Forming, Except Machining	290	2.8
	Foremen, Metal Shaping and Forming, Except Machining	715	2.8
	Tool-and Die-Making	415	4.0
	Sheet-Metal Workers	2,225	6.3
	TOTAL	8,090	2.2
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
	Other Fabricating and Assembling, Metal Products, n.e.c.	280	2.4
	Industrial, Farm and Construction Machinery Mechanics and Repairmen	450	7.2
	Painting and Decorating, Except Construction	270	7.2
	Other Product Fabricating, Assembling and Repairing, n.e.c.	165	7.5
	TOTAL	1,980	2.4

TABLE D.7 cont'd

OCCUPATIONAL INDICATORS: METAL STAMPING, PRESSING AND COATING INDUSTRY

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
MATERIAL HANDLING AND RELATED		
Packaging, n.e.c.	470	2.4
Material-Handling Equipment Operators, n.e.c.	405	6.8
TOTAL	1,185	3.2
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Mechanical Engineers	100	8.3
Architectural and Engineering Technologists and Technicians	180	16.2
TOTAL	675	6.1
PROCESSING		
Plating, Metal Spraying and Related	740	3.7
Foremen, Metal Processing and Related	275	4.3
Labouring and Other Elemental Work, Metal Processing	195	9.3
Inspecting, Testing, Grading and Sampling, Metal Processing	125	13.6
Metal Processing and Related, n.e.c.	600	20.2
TOTAL	2,260	7.0
MANAGERIAL, ADMINISTRATIVE AND RELATED		
General Managers and Other Senior Officials	180	(1.0)
Accountants, Auditors and Other Financial Officers	220	1.5
Purchasing Officers and Buyers, Except Wholesale and Retail Trade	120	4.1
Other Managers and Administrators, n.e.c.	180	13.7
Production Management	425	18.2
Sales and Advertising Management	185	24.9
TOTAL	1,600	7.2

() Indicates decline.

NOTE: Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.8

OCCUPATIONAL INDICATORS: METAL STAMPING, PRESSING AND COATING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I. TOTAL INDUSTRY	4,510	17.1	21.6	1,670
II. TWO DIGIT LEVEL				
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	380	21.5	19.2	45
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	80	4.0	11.9	65
MATERIAL HANDLING AND RELATED	310	24.9	26.2	95
MANAGERIAL, ADMINISTRATIVE AND RELATED	225	10.6	14.1	140
PROCESSING	305	10.0	13.5	190
MACHINING AND RELATED	1,345	10.6	16.6	660
III. FOUR DIGIT LEVEL				
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Other Product Fabricating, Assembling and Repairing, n.e.c.	30	31.3	18.2	5
Industrial, Farm and Construction Machinery Mechanics and Repairmen	10	0.0	2.2	10
Painting and Decorating, Except Construction	35	11.1	13.0	20
Other Fabricating and Assembling, Metal Products, n.e.c.	130	38.6	46.4	45
TOTAL	380	21.5	19.2	45
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Mechanical Engineers	0	0.0	0.0	0
Architectural and Engineering Technologists and Technicians	35	0.0	19.4	35
TOTAL	80	4.0	11.9	65

TABLE D.8 cont'd

OCCUPATIONAL INDICATORS: METAL STAMPING, PRESSING AND COATING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MATERIAL HANDLING AND RELATED				
Material-Handling Equipment Operators, n.e.c.	5	4.8	1.2	(5)
Packaging, n.e.c.	280	50.0	59.6	95
TOTAL	310	24.9	26.2	95
MANAGERIAL, ADMINISTRATIVE AND RELATED				
General Managers and Other Senior Officials	0	0.0	0.0	0
Accountants, Auditors and Other Financial Officers	25	13.2	11.4	0
Sales and Advertising Management	5	0.0	2.7	5
Production Management	5	0.0	1.2	5
Purchasing Officers and Buyers, Except Wholesale and Retail Trade	45	25.0	37.5	25
Other Managers and Administrators, n.e.c.	75	40.0	41.7	55
TOTAL	225	10.6	14.1	140
PROCESSING				
Foremen, Metal Processing and Related	0	0.0	0.0	0
Labouring and Other Elemental Work, Metal Processing	55	43.8	28.2	20
Inspecting, Testing, Grading and Sampling, Metal Processing	45	28.6	36.0	35
Plating, Metal Spraying and Related	90	9.7	12.2	40
Metal Processing and Related, n.e.c.	55	10.5	9.2	45
TOTAL	305	10.0	13.5	190

TABLE D.8 cont'd

OCCUPATIONAL INDICATORS: METAL STAMPING, PRESSING AND COATING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MACHINING AND RELATED				
Machine-Tool Operating	25	13.1	18.5	(30)
Machinist and Machine-Tool Setting-Up	25	9.0	5.7	(25)
Welding and Flame Cutting	70	11.2	7.0	(25)
Foremen, Metal Machining	5	2.8	4.0	0
Tool-and Die-making	5	0.0	1.2	5
Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	50	7.7	11.9	20
Foremen, Metal Shaping and Forming, Except Machining	40	1.9	5.6	30
Inspecting and Testing, Metal Shaping and Forming, Except Machining	75	15.9	25.9	40
Metalworking-Machine Operators, n.e.c.	570	18.4	27.0	265
Sheet-Metal Workers	445	6.2	20.0	370
TOTAL	1,345	10.6	16.6	660

() Indicates decline.

NOTE: Females employed in 1981 is calculated form percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.9

MAJOR PRODUCTS OF THE CANADIAN HARDWARE, TOOL AND CUTLERY MANUFACTURING INDUSTRY

	Value of Shipments In 1981 ($ Millions)	Percent of Total Shipments
Dies and moulds (other tan tungsten carbide)	218.0	21.2
Builders' and shelf hardware	166.6	16.2
Hand tools including edge tools and mechanics' and measuring tools	129.1	12.6
Safety razors and blades, table cutlery and parts for chain saws	97.5	9.5
Other cutting tools	59.0	5.7
Other hardware	57.0	5.5
Tungsten carbide products	43.8	4.3
Jigs, fixtures and metal working accessories	15.1	1.5
Metal cutting saw blades	8.0	0.8
Miscellaneous products *	232.5	22.7
TOTAL	1,026.5	100.0

* Includes other receipts, adjustments and estimate for small establishments not not reporting in detail.

NOTE: Details may not add to totals due to rounding.

SOURCE: Statistics Canada, Hardware, Tool & Cutlery Industry, Cat. No. 41-208, Table 5.

TABLE D.10

HARWARE, TOOL AND CUTLERY (SIC 306)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	406	427	437	447	454	456	427	516	564	623	614	652		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	201.3	238.5	308.5	365.1	382.9	427.2	466.7	521.2	654.7	734.5	740.1	736.4		
MANUFACTURING VALUE ADDED	135.1	160.5	203.6	242.8	243.1	264.7	296.5	352.4	434.4	489.4	495.5	494.7		
WAGES & SALARIES	81.6	96.7	120.3	141.2	147.2	164.1	171.7	194.2	237.4	263.0	274.6	285.4		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	8,340	9,316	10,885	11,692	10,885	11,143	9,962	10,461	11,783	11,709	11,142	10,045		
ADMINISTRATIVE STAFF	2,281	2,496	2,854	3,056	2,823	2,832	2,713	2,722	2,952	3,039	2,751	2,781		
TOTAL	10,621	11,812	13,739	14,748	13,708	13,975	12,675	13,183	14,735	14,748	13,893	12,826		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	1.0	2.6	4.7	2.9	2.4	2.5	2.8	3.2	9.3	7.6	7.1	x	3.6	1.3
MACHINERY & EQUIPMENT	6.9	7.8	12.5	12.3	14.0	16.1	13.7	20.8	29.1	40.0	33.2	x	14.2	19.8
TOTAL	7.9	10.4	17.2	15.2	16.4	18.6	16.5	24.0	38.4	47.6	40.3	21.6	17.8	21.1
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	12,724	13,591	14,822	16,465	17,737	18,943	23,392	26,731	29,482	33,183	35,664	38,573		
VALUE ADDED/$ LABOUR (SIC 306)	1.66	1.66	1.69	1.72	1.65	1.61	1.73	1.81	1.83	1.86	1.80	1.73		
VALUE ADDED/$ LABOUR (SIC 304, 306 AND 309)	1.81	1.82	1.83	1.96	1.88	1.82	1.85	1.91	1.99	1.96	2.00	1.87		
VALUE ADDED/$ LABOUR (United States)	1.99	1.95	1.99	2.13	2.09	2.13	2.16	2.16	2.22	2.17	2.16	2.14		
EXPORTS ($ Million)	40.1	54.3	70.6	83.8	76.3	87.1	124.8	150.3	181.4	193.1	213.1	194.3	235.4	
IMPORTS ($ Million)	75.9	90.2	111.3	146.1	144.1	163.5	182.8	226.4	276.0	316.7	365.6	294.2	325.2	
TRADE BALANCE ($ Million)	(35.8)	(35.9)	(40.7)	(62.2)	(67.8)	(76.4)	(58.0)	(76.1)	(94.6)	(123.6)	(152.6)	(99.9)	(89.8)	
NORMALIZED TRADE BALANCE	(0.308)	(0.249)	(0.224)	(0.271)	(0.308)	(0.305)	(0.189)	(0.202)	(0.207)	(0.242)	(0.264)	(0.204)	(0.160)	

( ) indicates deficit x - Secured to meet secrecy requirements of the Statistics Act.

NOTE: Data excludes Machinery and Transportation Equipment industries. Capacity Utilization Rate shown is for total Metal Fabricating. Value Added/$ Labour (United States) is for the total of SIC 304, 306 and 309.

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA: NATIONAL AND PROVINCIAL AREAS, Cat. No. 31-203; CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING, Cat. No. 31-003; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand. Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D11

HARWARE, TOOL AND CUTLERY (SIC 306)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	5.2	2.3	2.3	1.6	0.4	-6.4	20.8	9.3	10.5	-1.4	6.2		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	18.5	29.3	18.4	4.9	11.6	9.2	11.7	25.6	12.2	0.8	-0.5		
MANUFACTURING VALUE ADDED	18.8	26.8	19.2	0.1	8.9	12.0	18.9	23.3	12.7	1.2	-0.2		
WAGES & SALARIES	18.4	24.5	17.3	4.2	11.5	4.7	13.1	22.2	10.8	4.4	3.9		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	11.7	16.8	7.4	-6.9	2.4	-10.6	5.0	12.6	-0.6	-4.8	-9.8		
ADMINISTRATIVE STAFF	9.4	14.3	7.1	-7.6	0.3	-4.2	0.3	8.4	2.9	-9.5	1.1		
TOTAL	11.2	16.3	7.3	-7.1	1.9	-9.3	4.0	11.8	0.1	-5.8	-7.7		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	160.0	80.8	-38.3	-17.2	4.2	12.0	14.3	190.6	-18.3	-6.6	-	-	-63.9
MACHINERY & EQUIPMENT	13.0	60.3	-1.6	13.8	15.0	-14.9	51.8	39.9	37.5	-17.0	-	-	39.4
TOTAL	31.6	65.4	-11.6	7.9	13.4	-11.3	45.5	60.0	24.0	-15.3	-46.4	-17.6	18.5
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	6.8	9.1	11.1	7.7	6.8	23.5	14.3	10.3	12.6	7.5	8.2		
EXPORTS	35.3	30.1	18.8	-9.0	14.2	43.3	20.4	20.7	6.4	10.4	-8.8	21.1	
IMPORTS	18.9	23.4	31.2	-1.3	13.4	11.8	23.9	21.9	14.7	15.5	-19.5	10.5	

SOURCE: Calculated from Table D10 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D12

HARWARE, TOOL AND CUTLERY (SIC 306)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	406	427	437	447	454	456	427	516	564	623	614	652		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	201.3	232.7	289.7	298.8	277.7	290.0	287.0	291.0	315.8	308.1	276.0	248.8		
MANUFACTURING VALUE ADDED	135.1	149.9	182.3	198.2	176.7	180.0	177.4	204.2	225.8	216.8	204.0	165.7		
WAGES & SALARIES	81.6	92.9	107.8	113.7	107.2	110.5	107.0	112.5	125.8	125.9	117.6	110.3		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	8,340	9,316	10,885	11,692	10,885	11,143	9,962	10,461	11,783	11,709	11,142	10,045		
ADMINISTRATIVE STAFF	2,281	2,496	2,854	3,056	2,823	2,832	2,713	2,722	2,952	3,039	2,751	2,781		
TOTAL	10,621	11,812	13,739	14,748	13,708	13,975	12,675	13,183	14,735	14,748	13,893	12,826		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	1.0	2.5	4.1	2.2	1.6	1.6	1.7	1.8	4.7	3.4	2.9	x	1.3	0.4
MACHINERY & EQUIPMENT	6.9	7.6	11.7	10.1	10.1	11.0	8.6	11.6	14.8	18.4	13.7	x	5.3	7.0
TOTAL	7.9	10.1	15.8	12.3	11.7	12.6	10.3	13.4	19.5	21.8	16.6	8.1	6.6	7.4
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	12,724	12,690	13,270	13,441	12,891	12,877	13,999	15,487	15,323	14,702	14,683	12,922		

x Secured to meet secrecy requirements of the Statistics Act.

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for SIC 306; Value Added deflated by the Implicit Price Index for Gross Domestic Product for SIC 306; Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D10. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D13

HARWARE, TOOL AND CUTLERY (SIC 306)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	5.2	2.3	2.3	1.6	0.4	-6.4	20.8	9.3	10.5	-1.4	6.2		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	15.6	24.5	3.2	-7.1	4.4	-1.0	1.4	8.5	-2.5	-10.4	-9.8		
MANUFACTURING VALUE ADDED	10.9	21.6	8.7	-10.9	1.8	-1.4	15.1	10.6	-4.0	-5.9	-18.7		
WAGES & SALARIES	13.8	16.0	5.4	-5.7	3.1	-3.1	5.1	11.8	0.1	-6.5	-6.3		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	11.7	16.8	7.4	-6.9	2.4	-10.6	5.0	12.6	-0.6	-4.8	-9.8		
ADMINISTRATIVE STAFF	9.4	14.3	7.1	-7.6	0.3	-4.2	0.3	8.4	2.9	-9.5	1.1		
TOTAL	11.2	16.3	7.3	-7.1	1.9	-9.3	4.0	11.8	0.1	-5.8	-7.7		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	150.0	64.0	-46.3	-27.3	0.0	6.3	5.9	161.1	-27.7	-14.7	-	-	-69.2
MACHINERY & EQUIPMENT	10.1	53.9	-13.7	0.0	8.9	-21.8	34.9	27.6	24.3	-25.5	-	-	32.1
TOTAL	27.8	56.4	-22.2	-4.9	7.7	-18.3	30.1	45.5	11.8	-23.9	-51.2	-18.5	12.1
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	-0.3	4.6	1.3	-4.1	-0.1	8.7	10.6	-1.1	-4.1	-0.1	-12.0		

SOURCE: Calculated from Table D12 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.14

OCCUPATIONAL INDICATORS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
I.	TOTAL INDUSTRY	18,740	5.5
II.	TWO DIGIT LEVEL		
	MACHINING AND RELATED	9,085	4.9
	MATERIAL HANDLING AND RELATED	525	6.5
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	620	7.0
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	1,745	7.7
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,260	7.9
	PROCESSING	1,425	11.4
II.	FOUR DIGIT LEVEL		
	MACHINING AND RELATED		
	Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	490	1.9
	Machine-Tool Operating	1,090	2.0
	Metalworking - Machine Operators, n.e.c.	695	3.6
	Foremen, Metal Machining	775	4.6
	Welding and Flame Cutting	250	4.9
	Tool- and Die-Making	3,120	5.2
	Machinist and Machine-Tool Setting-Up	1,340	5.5
	Inspecting and Testing, Metal Machining	135	6.1
	Foremen, Metal Shaping and Forming, except Machinery	125	7.6
	Forging	105	8.8
	Patternmakers and Mouldmakers, n.e.c.	315	14.7
	Sheet-Metal Workers	345	18.2
	TOTAL	9,085	4.9
	MATERIAL HANDLING AND RELATED		
	Packaging, n.e.c.	285	2.9
	TOTAL	525	6.5
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
	Architectural and Engineering Technologists and Technicians	180	6.1
	Draughtsmen	135	12.9
	TOTAL	620	7.0

TABLE D.14 cont'd

OCCUPATIONAL INDICATORS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
Other Product Fabricating, Assembling and Repairing, n.e.c.	145	5.5
Other Fabricating and Assembling, Metal Products, n.e.c.	485	9.3
Industrial, Farm and Construction Machinery Mechanics and Repairmen	140	14.9
Electrical Equipment Fabricating and Assembling	125	17.5
TOTAL	1,745	7.7
MANAGERIAL, ADMINISTRATIVE AND RELATED		
General Managers and Other Senior Officials	200	1.6
Accountants, Auditors and Other Financial Officers	145	5.5
Other Managers and Administrators, n.e.c.	185	14.0
Sales and Advertising Management	185	20.0
Production Management	310	20.0
TOTAL	1,260	7.9
PROCESSING		
Plating, Metal Spraying and Related	100	6.2
Moulding, Coremaking and Metal Casing	565	12.4
Metal Processing and Related, n.e.c.	300	25.9
TOTAL	1,425	11.4

() Indicates decline.

NOTE: Figures do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.15

OCCUPATIONAL INDICATORS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I. TOTAL INDUSTRY	3,975	19.6	21.2	1,835
II. TWO DIGIT LEVEL				
MATERIAL HANDLING AND RELATED	235	73.2	44.8	30
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	50	1.6	8.1	45
MANAGERIAL, ADMINISTRATIVE AND RELATED	170	9.3	13.5	115
PROCESSING	205	11.3	14.4	150
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	605	33.1	34.7	330
MACHINING AND RELATED	810	8.3	8.9	340
III. FOUR DIGIT LEVEL				
MATERIAL HANDLING AND RELATED				
Packaging, n.e.c.	215	88.4	75.4	25
TOTAL	235	73.2	44.8	30
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Architectural and Engineering Technologists and Technicians	0	0.0	0.0	0
Draughtsmen	15	0.0	11.1	15
TOTAL	50	1.6	8.1	45

TABLE D.15 cont'd

OCCUPATIONAL INDICATORS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MANAGERIAL, ADMINISTRATIVE AND RELATED				
General Managers and Other Senior Officials	0	0.0	0.0	0
Production Management	0	0.0	0.0	0
Sales and Advertising Management	5	0.0	2.7	5
Other Managers and Administrators, n.e.c.	60	60.0	32.4	30
Accountants, Auditors and Other Financial Officers	45	11.8	31.0	35
TOTAL	170	9.3	13.5	115
PROCESSING				
Plating, Metal Spraying and Related	15	18.2	15.0	5
Moulding, Coremaking and Metal Casting	15	2.9	2.7	10
Metal Processing and Related, n.e.c.	40	50.0	13.3	25
TOTAL	205	11.3	14.4	150
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Industrial, Farm and Construction Machinery Mechanics and Repairmen	0	0.0	0.0	0
Other Product Fabricating, Assembling and Repairing, n.e.c.	40	41.2	27.6	5
Electrical Equipment Fabricating and Assembling	90	40.0	72.0	80
Other Fabricating and Assembling, Metal Products, n.e.c.	280	52.5	57.7	175
TOTAL	605	33.1	34.7	330

TABLE D.15 cont'd

OCCUPATIONAL INDICATORS: HARDWARE, TOOL AND CUTLERY MANUFACTURERS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MACHINING AND RELATED				
Inspecting and Testing, Metal Machining	20	46.7	14.8	(15)
Machine-Tool Operating	95	11.2	8.7	(5)
Patternmakers and Mouldmakers, n.e.c.	0	0.0	0.0	0
Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	70	16.0	14.3	5
Foremen, Metal Machining	15	0.0	1.9	15
Machinist and Machine-Tool Setting-Up	45	3.8	3.4	15
Foremen, Metal Shaping and Forming, Except Machining	15	0.0	12.0	15
Forging	35	0.0	33.3	35
Welding and Flame Cutting	55	6.5	22.0	45
Tool- and-Die-Making	80	1.3	2.6	55
Sheet-Metal Workers	75	23.1	21.7	60
Metalworking-Machine Operators, n.e.c.	225	31.6	32.4	70
TOTAL	810	8.3	8.9	340

() Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.16

MAJOR PRODUCTS OF THE CANADIAN MISCELLANEOUS METAL FABRICATING INDUSTRIES

	Value of Shipments In 1981 ($ Millions)	Percent of Total Shipments
Valves and Parts	229.5	14.6
Forgings and Castings	213.8	13.6
Fabricated Structural Products	154.9	9.8
Pipe Fittings	113.3	7.2
Plumbers' Brass Goods and Fixture Trim	88.5	5.6
Plumbing Equipment and Fittings, n.e.c.	75.4	4.8
Metal Fabricated Basic Products, Other	73.2	5.7
Railway Track Material and Equipment	47.0	3.0
Sinks including Wash Basins and Laundry Tubs	33.9	2.2
Meters, Gas or Liquid and Parts	29.3	1.9
Safes and Vaults	22.6	1.4
Other Products*	493.2	31.3
TOTAL	1,574.6	100.0

* Includes other receipts, adjustments and estimate for small establishments not reporting in detail.

NOTE: Figures may not add to totals due to rounding.

SOURCE: Statistics Canada, Miscellaneous Metal Fabricating Industries, Cat. No. 41-228. Table 5.

TABLE D.17

MISCELLANEOUS METAL FABRICATING (SIC 309)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	306	293	290	294	290	320	315	362	358	376	351	340		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	374.2	394.2	493.6	636.9	677.7	734.1	791.4	927.7	1,030.8	1,117.2	1,134.8	1,042.0		
MANUFACTURING VALUE ADDED	184.7	198.6	246.3	322.6	340.2	351.7	386.6	456.6	497.2	536.6	563.1	505.7		
WAGES & SALARIES	98.3	107.2	128.9	151.9	166.5	185.0	204.4	237.6	245.4	272.6	269.1	255.6		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	10,101	10,371	11,377	12,029	12,250	12,433	12,541	13,776	13,060	12,412	11,334	9,125		
ADMINISTRATIVE STAFF	3,431	3,332	3,517	3,873	3,435	3,492	3,541	3,773	3,507	3,658	3,359	3,110		
TOTAL	13,532	13,703	14,894	15,902	15,685	15,925	16,082	17,549	16,567	16,070	14,693	12,235		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	3.1	2.4	5.2	9.9	6.4	8.3	9.5	x	7.6	14.7	13.8	3.5	1.8	3.2
MACHINERY & EQUIPMENT	12.3	13.1	14.3	22.2	21.8	21.4	26.5	x	47.0	45.9	42.3	29.1	18.4	24.7
TOTAL	15.4	15.5	19.5	32.1	28.2	29.7	36.0	34.6	54.6	60.6	56.1	32.6	20.2	27.9
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	13,649	14,494	16,539	20,287	21,688	22,086	24,039	26,019	30,012	33,391	38,323	41,334		
VALUE ADDED/$ LABOUR (SIC 309)	1.88	1.85	1.91	2.12	2.04	1.90	1.89	1.92	2.03	1.97	2.09	1.98		
VALUE ADDED/$ LABOUR (SIC 304, 306 and 309)	1.81	1.82	1.83	1.96	1.88	1.82	1.85	1.91	1.99	1.96	2.00	1.87		
VALUE ADDED/$ LABOUR (United States)	1.99	1.95	1.99	2.13	2.09	2.13	2.16	2.16	2.22	2.17	2.16	2.14		
EXPORTS ($ Million)	34.7	37.4	44.2	51.7	53.7	52.0	62.4	85.7	150.6	146.5	173.9	163.2	188.4	
IMPORTS ($ Million)	87.3	100.1	127.3	175.0	213.8	219.4	239.0	340.6	404.7	386.5	437.9	345.9	359.1	
TRADE BALANCE ($ Million)	(52.6)	(62.7)	(83.1)	(123.3)	(160.2)	(167.3)	(176.7)	(254.9)	(254.1)	(240.0)	(264.1)	(182.6)	(170.6)	
NORMALIZED TRADE BALANCE	(0.431)	(0.456)	(0.484)	(0.544)	(0.599)	(0.617)	(0.586)	(0.598)	(0.458)	(0.450)	(0.432)	(0.359)	(0.312)	

( ) indicates deficit x Secured to meet secrecy requirements of the Statistics Act.

NOTE: Data excludes Machinery and Transportation Equipment industries. Capacity Utilization Rate shown is for total Metal Fabricating. Value Added/$ Labour (United States) is for the total of SIC 304, 306 and 309.

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA: NATIONAL AND PROVINCIAL AREAS, Cat. No. 31-203; CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING, Cat. No. 31-003; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand. Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D18

MISCELLANEOUS METAL FABRICATING (SIC 309)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-4.2	-1.0	1.4	-1.4	10.3	-1.6	14.9	-1.1	5.0	-6.6	-3.1		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	5.3	25.2	29.0	6.4	8.3	7.8	17.2	11.1	8.4	1.6	-8.2		
MANUFACTURING VALUE ADDED	7.5	24.0	31.0	5.4	3.4	9.9	18.1	8.9	7.9	4.9	-10.2		
WAGES & SALARIES	9.1	20.2	17.8	9.6	11.1	10.5	16.2	3.3	11.1	-1.3	-5.0		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	2.7	9.7	5.7	1.8	1.5	0.9	9.8	-5.2	-5.0	-8.7	-19.5		
ADMINISTRATIVE STAFF	-2.9	5.6	10.1	-11.3	1.7	1.4	6.6	-7.1	4.3	-8.2	-7.4		
TOTAL	1.3	8.7	6.8	-1.4	1.5	1.0	9.1	-5.6	-3.0	-8.6	-16.7		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	-22.6	116.7	90.4	-35.4	29.7	14.5	-	-	93.4	-6.1	-74.6	-48.6	77.8
MACHINERY & EQUIPMENT	6.5	9.2	55.2	-1.8	-1.8	23.8	-	-	-2.3	-7.8	-31.2	-36.8	34.2
TOTAL	0.6	25.8	64.6	-12.1	5.3	21.2	-3.9	57.8	11.0	-7.4	-41.9	-38.0	38.1
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	6.2	14.1	22.7	6.9	1.8	8.8	8.2	15.3	11.3	14.8	7.9		
EXPORTS	7.9	18.1	16.9	3.8	-3.0	19.9	37.4	75.8	-2.7	18.7	-6.1	15.5	
IMPORTS	14.7	27.1	37.5	22.2	2.6	9.0	42.5	18.8	-4.5	13.3	-21.0	3.8	

SOURCE: Calculated from Table D17 by Economics Practice, Currie, Coopers & Lybrand. Calculations are based on unrounded data where available.

TABLE D19

MISCELLANEOUS METAL FABRICATING (SIC 309)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	306	293	290	294	290	320	315	362	358	376	351	340		
CAPACITY UTILIZATION RATE, CANADA	83.2	83.2	88.5	92.0	79.7	81.8	78.6	80.2	83.5	79.5	77.5	62.7	60.3	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	374.2	376.5	437.6	471.5	445.0	452.3	459.6	492.9	487.4	480.1	443.3	375.1		
MANUFACTURING VALUE ADDED	184.7	190.6	231.7	249.5	230.9	226.9	231.2	244.8	260.0	240.4	232.1	195.0		
WAGES & SALARIES	98.3	103.1	115.5	122.3	121.3	124.6	127.4	137.6	130.0	130.5	115.3	98.8		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	10,101	10,371	11,377	12,029	12,250	12,433	12,541	13,776	13,060	12,412	11,334	9,125		
ADMINISTRATIVE STAFF	3,431	3,332	3,517	3,873	3,435	3,492	3,541	3,773	3,507	3,658	3,359	3,110		
TOTAL	13,532	13,703	14,894	15,902	15,685	15,925	16,082	17,549	16,567	16,070	14,693	12,235		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	3.1	2.3	4.5	7.4	4.3	5.2	5.6	x	3.8	6.6	5.6	1.3	0.6	1.1
MACHINERY & EQUIPMENT	12.3	12.8	13.4	18.2	15.7	14.6	16.5	x	23.9	21.2	17.5	11.1	6.8	8.7
TOTAL	15.4	15.1	17.9	25.6	20.0	19.8	22.1	19.3	27.7	27.8	23.1	12.4	7.4	9.8
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	13,649	13,909	15,558	15,690	14,724	14,249	14,378	13,951	15,697	14,960	15,797	15,934		

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for all Metal Fabricating industries (excluding Machinery and Transportation Equipment) as the ISPI for SIC 309 is secured to meet secrecy requirements of ths Statistics Act; Value Added deflated by the Implicit Price Index for Gross Domestic Product for SIC 309; Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D17. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D20

MISCELLANEOUS METAL FABRICATING (SIC 309)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	-4.2	-1.0	1.4	-1.4	10.3	-1.6	14.9	-1.1	5.0	-6.6	-3.1		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	0.6	16.2	7.7	-5.6	1.6	1.6	7.3	-1.1	-1.5	-7.7	-15.4		
MANUFACTURING VALUE ADDED	3.2	21.6	7.7	-7.4	-1.7	1.9	5.9	6.2	-7.6	-3.5	-16.0		
WAGES & SALARIES	4.9	12.1	5.9	-0.8	2.7	2.2	8.0	-5.5	0.4	-11.7	-14.3		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	2.7	9.7	5.7	1.8	1.5	0.9	9.8	-5.2	-5.0	-8.7	-19.5		
ADMINISTRATIVE STAFF	-2.9	5.6	10.1	-11.3	1.7	1.4	6.6	-7.1	4.3	-8.2	-7.4		
TOTAL	1.3	8.7	6.8	-1.4	1.5	1.0	9.1	-5.6	-3.0	-8.6	-16.7		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	-25.8	95.7	64.4	-41.9	20.9	7.7	-	-	73.7	-15.2	-76.8	-53.8	83.3
MACHINERY & EQUIPMENT	4.1	4.7	35.8	-13.7	-7.0	13.0	-	-	-11.3	-17.5	-36.6	-38.7	27.9
TOTAL	-1.9	18.5	43.0	-21.9	-1.0	11.6	-12.7	43.5	0.4	-16.9	-46.3	-40.3	32.4
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	1.9	11.9	0.8	-6.2	-3.2	0.9	-3.0	12.5	-4.7	5.6	0.9		

SOURCE: Calculated from Table D19 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.21

OCCUPATIONAL INDICATORS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
I.	TOTAL INDUSTRY	16,940	3.3
II.	TWO DIGIT LEVEL		
	MACHINING AND RELATED	5,705	3.4
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	2,235	3.7
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	710	4.0
	MATERIAL HANDLING AND RELATED	655	4.4
	PROCESSING	1,605	6.1
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,440	8.3
II.	FOUR DIGIT LEVEL		
	MACHINING AND RELATED		
	Machine-Tool Operating	705	(1.8)
	Foremen, Metal Machining	180	(1.5)
	Tool- and Die-Making	210	(0.7)
	Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	275	0.2
	Metalworking - Machine Operators, n.e.c.	690	2.1
	Foremen, Metal Shaping and Forming, Except Machining	370	4.0
	Forging	300	4.1
	Machinist and Machine-Tool Setting-Up	815	5.1
	Welding and Flame Cutting	1,250	7.4
	Inspecting and Testing, Metal Shaping and Forming Except Machining	145	8.4
	Sheet-Metal Workers	525	15.0
	TOTAL	5,705	3.4
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
	Painting and Decorating, Except Construction	115	(0.8)
	Other Fabricating and Assembling, Metal Products, n.e.c.	670	5.2
	Other Product Fabricating, Assembling and Repairing, n.e.c.	200	5.7
	Inspecting and Testing, Fabricating and Assembling Metal Products, n.e.c.	115	7.7
	Foremen, Fabricating and Assembling, Metal Products, n.e.c.	120	9.1

TABLE D.21 cont'd

OCCUPATIONAL INDICATORS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT, 1971-1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING(cont'd)		
Industrial, Farm and Construction Machinery Mechanics and Repairmen	240	10.3
TOTAL	2,235	3.7
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Draughtsmen	130	3.2
Architectural and Engineering Technologists and Technicians	160	12.3
TOTAL	710	4.0
MATERIAL HANDLING AND RELATED		
Packaging, n.e.c.	215	1.5
Hoisting, n.e.c.	125	7.6
Material-Handling Equipment Operators, n.e.c.	210	7.7
TOTAL	655	4.4
PROCESSING		
Moulding, Coremaking and Metal Casting	105	(6.9)
Foremen, Metal Processing and Related	105	(0.9)
Metal Smelting, Converting and Refining Furnacemen	150	2.7
Labouring and Other Elemental Work, Metal Processing	155	10.9
Metal Heat-Treating	220	12.1
Metal Processing and Related, n.e.c.	570	19.0
TOTAL	1,605	6.1
MANAGERIAL, ADMINISTRATIVE AND RELATED		
Accountants, Auditors and Other Financial Officers	185	0.8
General Managers and Other Senior Officials	180	4.1
Sales and Advertising Management	175	14.5
Other Managers and Administrators, n.e.c.	175	15.9
Production Management	420	22.5
TOTAL	1,440	8.3

() Indicates decline.

NOTE: Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.22

OCCUPATIONAL INDICATORS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I. TOTAL INDUSTRY	3,270	19.6	19.3	865
II. TWO DIGIT LEVEL				
MATERIAL HANDLING AND RELATED	150	29.4	22.9	25
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	50	1.0	7.0	45
PROCESSING	135	9.6	8.4	50
MANAGERIAL, ADMINISTRATIVE AND RELATED	155	12.3	10.8	75
MACHINING AND RELATED	480	9.0	8.4	110
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	645	28.4	28.9	205
III. FOUR DIGIT LEVEL				
MATERIAL HANDLING AND RELATED				
Hoisting, n.e.c.	0	0.0	0.0	0
Material-Handling Equipment Operators, n.e.c.	0	0.0	0.0	0
Packaging, n.e.c.	135	62.2	62.8	20
TOTAL	150	29.4	22.9	25
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Architectural and Engineering Technologists and Technicians	10	0.0	6.3	10
Draughtsmen	15	0.0	11.5	15
TOTAL	50	1.0	7.0	45

TABLE D.22 Cont'd

OCCUPATIONAL INDICATORS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
PROCESSING				
Moulding, Coremaking and Metal Casting	5	4.7	4.8	(5)
Foremen, Metal Processing and Related	0	0.0	0.0	0
Metal Heat-Treating	5	0.0	2.3	5
Metal Smelting, Converting and Refining Furnacemen	10	0.0	6.7	10
Labouring and Other Elemental Work, Metal Processing	30	36.4	19.4	10
Metal Processing and Related, n.e.c.	30	15.0	5.3	15
TOTAL	135	9.6	8.4	50
MANAGERIAL, ADMINISTRATIVE AND RELATED				
Accountants, Auditors and Other Financial Officers	20	26.5	10.8	(25)
General Managers and Other Senior Officials	5	0.0	2.8	5
Sales and Advertising Management	5	0.0	2.9	5
Production Management	10	0.0	2.4	10
Other Managers and Administrators, n.e.c.	60	50.0	34.3	40
TOTAL	155	12.3	10.8	75
MACHINING AND RELATED				
Machine-Tool Operating	70	11.8	9.9	(30)
Tool- and Die-Making	0	4.4	0.0	(10)
Machinist and Machine-Tool Setting-Up	20	6.1	2.5	(10)
Foremen, Metal Machining	0	2.4	0.0	(5)
Foremen, Metal Shaping and Forming, Except Machining	10	2.0	2.7	5
Welding and Flame Cutting	50	6.6	4.0	10

TABLE D.22 Cont'd

OCCUPATIONAL INDICATORS: MISCELLANEOUS METAL FABRICATING INDUSTRIES

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MACHINING AND RELATED (cont'd)				
Inspecting and Testing, Metal Shaping and Forming, Except Machining	20	15.4	13.8	10
Forging	15	0.0	5.0	15
Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	35	5.6	12.7	20
Metalworking-Machine Operators, n.e.c.	140	17.9	20.3	40
Sheet-Metal Workers	85	0.0	16.2	85
TOTAL	480	9.0	8.4	110
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Industrial, Farm and Construction Machinery Mechanics and Repairmen	0	0.0	0.0	0
Foremen, Fabricating and Assembling, Metal Products, n.e.c.	15	0.0	12.5	15
Painting and Decorating, Except Construction	30	12.0	26.1	15
Inspecting and Testing, Fabricating and Assembling Metal Products, n.e.c.	35	27.3	30.4	20
Other Product Fabricating, Assembling and Repairing, n.e.c.	70	39.1	35.0	25
Other Fabricating and Assembling, Metal Products, n.e.c.	260	44.4	38.8	80
TOTAL	645	28.4	28.9	205

() Indicates decline

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy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